Nov. 27, 1956 H. A. HIDDE NIJLAND 2,772,335

CIRCUIT BREAKERS

Filed Dec. 14, 1954

FIG. 1

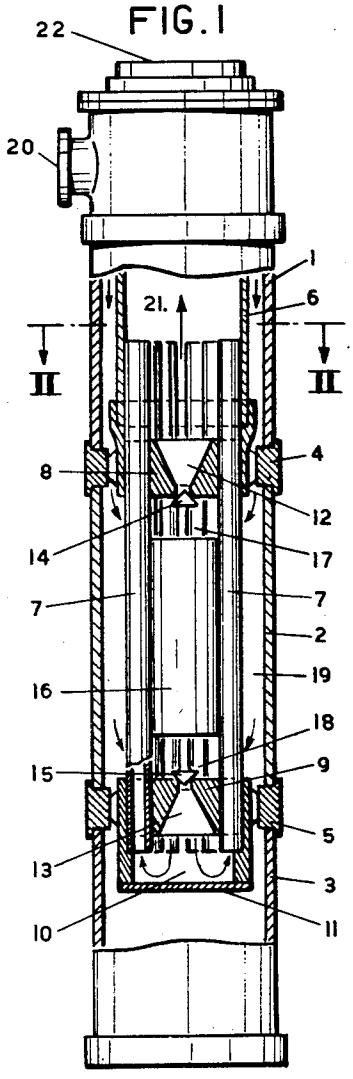
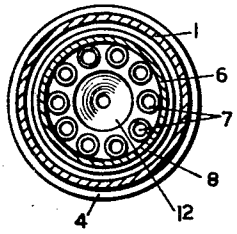


FIG. 2



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CIRCUIT BREAKERS

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2 Claims. (Cl. 200—148)

The invention relates to a circuit breaker, in which the arc caused by the switching operation is extinguished by compressed gas. The circuit breaker comprises a plurality of tubes of insulating material, at least two electrically conductive contact holders supported and kept spaced apart by said tubes, at least two annular switching contacts supported by said contact holders, the central opening of each switching contact being kept closed when the circuit breaker is in its closed position, but being opened during the opening operation of the circuit breaker, gas-outlet means comprising said tubes of insulating material and connected to the central openings of said switching contacts, said means enabling the extinguishing gas passing through said openings to flow to the outside.

In a known circuit breaker of the above described type the extinguishing gas flowing through the gas discharge conduits comes into contact with all contact holders. Moreover all tubular or annular switching contacts discharge their extinguishing gas into discharge passages formed by hollow insulators for keeping the conductive parts spaced from one another. Owing to such first feature this known construction is only suitable for relatively low voltages. Obviously the current of ionized extinguishing gas may not be able to establish an electrically conductive connection between the contact holders which become electrically separated during the opening operation. Due to the second feature there are caused eddy-currents and gas-congestions in the discharge passages and outlet conduits, whereby the rapid discharge of the ionized gases is effected.

The invention has for its object the simple construction of a circuit breaker of this kind which can be used for ultra high voltages. In the circuit breaker of the invention the tubes of insulating material are connected to the central opening of one switching contact only and pass through the contact holder of the second switching contact, said tubes of insulating material opening at a distance beyond the second contact holder, thereby preventing the gas discharged by said tubes to come into contact with said second contact holder. Advantageously the space in which the switching contacts are accommodated and the switching operation takes place is surrounded by a circular series of the said tubes of insulating material, and the second annular switching contact communicates with its central opening with the central space surrounded by the portions of said tubes extending beyond said second contact holder. The invention prevents the electric short-circuiting of the contact holders by the ionized extinguishing gas. Further, the currents of gas escaping through the various tubular or annular switching contacts flow in the same direction, so that they do not disturb one another when they meet. The circuit-breaker can easily be made radially symmetrical, so that a field distribution suitable for very high voltages can be obtained in the circuit breaker.

It may be noted that circuit breakers in which the extinguishing gas discharging from one tubular or annular

switching contact is deionized by a filter before it comes into contact with the second contact holder are old. However, such filters offer a considerable resistance, and in such circuit breakers the escaping jets of gas disturb one another as much as those in the known construction described above.

For the further disclosure of the invention reference is made to the accompanying drawing, in which:

Fig. 1 is a view partially in vertical section and partially in elevation of the part of a circuit breaker essential to understand the invention, said circuit breaker being provided with two pairs of switching contacts for the interruption of the energy connected in series, and

Fig. 2 is a cross sectional view on the line II—II in Fig. 1.

The drawing shows only the inner construction of the part for the energy interruption of a circuit breaker. Therein the actual switching element is surrounded by an insulating wall, which consists of tubes **1**, **2**, **3** of insulating material and of metal rings **4**, **5** for conducting the electric current. This composite wall forms a part of a casing, which is not shown further. The switching element is accommodated in a composite tubular body consisting of tubes **6**, **7** of insulating material and of metal contact rings **8**, **9**. The tubes **7** are mounted in a circular series around the actual switching space. They project into the contact ring **9** and open into a space **10** thereof. Said tubes also pass through the contact ring **8** and are open at some distance therefrom. The space **10** of the contact ring **9** is closed by a plate **11**. The contact rings **8**, **9** are provided with passages **12**, **13** therethrough, which serve for the discharge of the extinguishing gas, but are normally kept closed by means of movable switching contacts **14**, **15** operating as valves. Said switching contacts are moved in a suitable known manner, for instance by means of the extinguishing gas itself. They are electrically connected in series. The driving mechanism is not shown and is partly or entirely contained within the cylinder **16**.

The insulating tubes **7** are mounted at some distance from one another so that the switching spaces **17**, **18** communicate with the space **19** within the composite tubular wall **1**—**5** of the casing. When the extinguishing gas is supplied at **20** it flows through the central space **19** and passes through the gaps left between the tubes **7** into said switching spaces **17** and **18**. If, after the gas in the switching spaces has obtained a predetermined pressure, the movable switching contacts **14**, **15** are removed from the fixed contact rings **8**, **9**, the extinguishing gas will escape with great force through the openings **12**, **13** and thereby extinguish the arcs between the contacts and rings. The ionized extinguishing gas contained in the switching space **17** flows directly through the opening **12** into the larger space **21** surrounded by the tube **6** and thence into the open air or towards a discharge conduit (not shown). The extinguishing gas contained in the switching space **18** flows through the opening **13** into the space **10** and thence through the circular series of tubes **7**, also contained in space **21**. After it has passed the fixed contact **9**, the extinguishing gas flowing through the tubes **7** no longer comes into contact with live parts, such as the contact ring **8**. Said gas has to go a relatively long way before it joins, in the space **21**, the extinguishing gas coming from the switching space **17**. Because of this, the extinguishing gas escaping from the switching space **18** becomes quickly deionized, so that it is not able any more to form an electrically conductive path between the contact rings **8** and **9**. The extinguishing gas flowing through the tubes **7** into the space **21** and the extinguishing gas flowing into the space **21** through the contact opening **12** have the same direction of movement. That is why the currents

of gas do not disturb one another and eddy currents offering resistance to gas flow are nearly entirely prevented. The extinguishing gases escape at 22 at the upper end of the circuit breaker either into the open air or into a discharge conduit (not shown).

It will be apparent that a circuit breaker having four places or zones of circuit interruption connected in series will be obtained, when two switching elements of the illustrated construction are placed in alignment in reversed positions. Preferably the switching elements are placed in such a manner that the extinguishing gas coming from one pair of zones of circut interruption escapes at one end, e. g. the upper end, of the circuit breaker, but the extinguishing gas coming from the other pair of zones of interruption is discharged at the other end, e. g. the lower end, of the circuit breaker.

What I claim is:

1. A circuit-breaker in which the arc caused by the switching operation is extinguished by compressed gas, comprising a plurality of tubes of insulating material, at least two electrically conductive contact holders supported and kept spaced apart by said tubes, at least two annular switching contacts supported by said contact holders, the central opening of each switching contact being kept closed when the circuit breaker is in its

closed position but being opened during the opening operation of the circuit breaker, and gas-outlet means connected to the central openings of said switching contacts, said tubes of insulating material forming a portion of said gas-outlet means, said gas-outlet means enabling the extinguishing gas passing through said opening to flow to the outside, the tubes of insulating material being connected to the central opening of one switching contact only and passing through the contact holder of the other switching contact, said tubes of insulating material opening at a distance beyond the latter contact holder, thereby preventing the gas discharged by said tubes from coming into contact with said latter contact holder.

2. A circuit-breaker as claimed in claim 1, in which the space in which the switching contacts are accommodated and the switching operation takes place is surrounded by a circular series of the said tubes of insulating material, and the central opening in the second annular switching contact communicates with a central space surrounded by the portions of said tubes extending beyond said second contact holder.

No references cited.