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GAS-BLAST CIRCUIT BREAKERS

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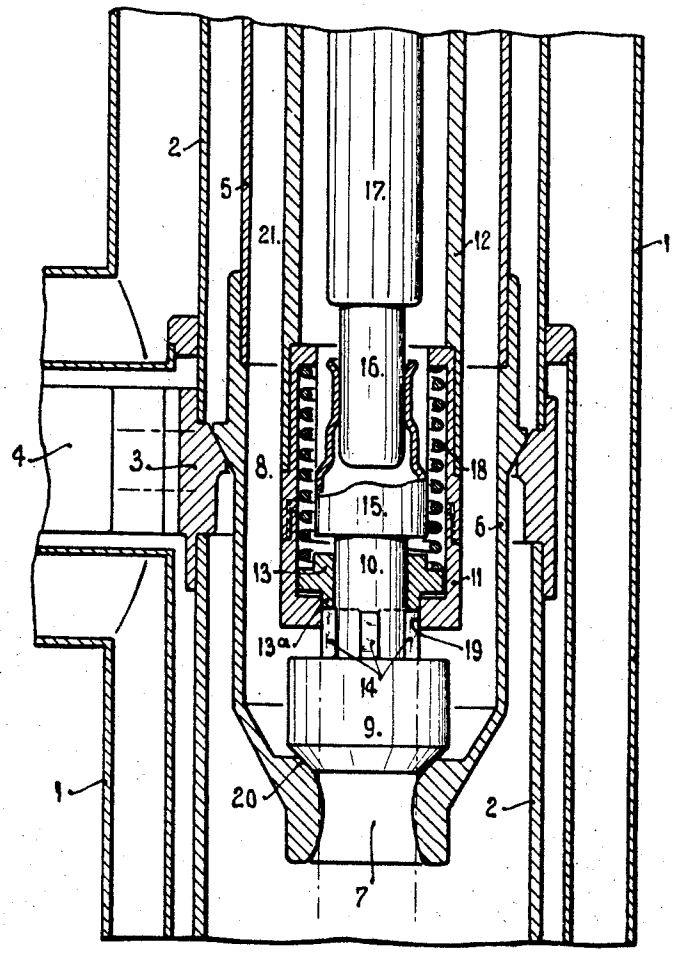

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GAS-BLAST CIRCUIT BREAKERS

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3 Claims. (Cl. 200—148)

The invention relates to a gas-blast circuit breaker comprising in combination an arcing compartment adapted to be supplied with compressed extinguishing gas, mounted in said compartment at least one switching contact having an opening for the discharge of extinguishing gas from said compartment and at least one second switching contact cooperating with the first mentioned one both electrically and as a valve in order to open and to close said discharge opening, at least one of said cooperating switching contacts being mounted for movement against spring pressure in the switching-off direction, a cylinder having one end in communication with said arcing compartment, a piston slidably mounted in said cylinder and adapted to drive said movable switching contact away from the other switching contact and a lost motion connection provided between said piston and said movable switching contact, said piston having a reduced portion adapted to engage a part of the cylinder chamber, which part has a correspondingly reduced diameter and is in permanent communication with the arcing compartment, said lost motion connection permitting the piston, which during the switching-off operation is exposed to the pressure of the gas in the arcing compartment first with its reduced portion and thereupon with its portion of greater diameter and is moved against spring pressure at least during the first part of its stroke, to be connected with the movable switching contact only after it has left the part of reduced diameter of the cylinder chamber.

Circuit breakers of this kind have been disclosed by the U.S. patent specification 2,500,429. In these known circuit breakers the spring keeping the switching contacts pressed one upon the other when circuit breaker is in its closed position is so dimensioned as to exert not only the contact pressure required under normal operating circumstances but also the considerably higher contact pressure, which is necessary during the period when, during the switching-off operation under abnormal circumstances, the piston moves freely due to the lost motion connection. That is why these circuit breakers are provided with relatively strong springs for biasing the switching contacts towards one another.

The invention has for its object to alter the construction of the above mentioned circuit breakers such as to avoid the necessity to over-dimension the contact pressure, whereby a saving of room especially in axial direction is realized. It consists in that the smallest diameter of the annular contact area between the two cooperating switching contacts is greater than the diameter of the reduced piston portion. In that case the extinguishing gas itself keeps the switching contact to be moved by the piston pressed on the other switching contact as long as the piston moves freely. It will be obvious that the mentioned diameter of the contact area must be smaller than the diameter of the greater piston area. If this should be not so the piston would not be able to withdraw the movable switching contact from the other contact and to break the circuit.

In the known circuit breakers the spring producing the contact pressure has to keep the switching contacts pressed one on the other while the piston has its free movement, so that the movable contact and the piston are loaded by separate springs.

The invention makes it possible to combine these two springs. In that case the provision of an abutment on the switching contact adapted to be moved by the piston during the switching-off operation is recommended and the construction must be such as to allow the piston to be pressed by spring pressure against said abutment and to keep said movable switching contact resiliently pressed on the other switching contact, when the circuit breaker is in its stationary condition. Especially in circuit breakers in which the interruption on load of the circuit is carried out in another place and by means of other switching contacts than the interruption under no load conditions for keeping the circuit permanently open, the combination of the two springs makes it possible to simplify the construction and to reduce the axial dimension of the circuit breaker considerably.

For the elucidation of the invention reference is made to the accompanying drawing, which illustrates an elevational sectional view of that part of a gas-blast circuit breaker only which is essential to understand the invention.

In the drawing **1** is a metal casing, **2** is the insulating inner wall of said casing and **3** is a metal contact ring forming part of said inner wall and connected with the conductor of a leading-in insulator **4**. Mounted within the double-walled casing **1**, **2**, **3** is a switching element, which is provided with a tubular fixed switching contact **6** attached to a tube **5** of insulating material and electrically connected to the contact ring **3**. The fixed switching contact **6** has an opening **7** for the discharge of extinguishing gas from the arcing compartment **8** formed within the tube **5** and the fixed switching contact **6**.

A movable switching contact **9** adapted to act as a valve and to close the discharge opening **7** for the extinguishing gas cooperates with the fixed switching contact **6**. Said switching contact **9** is provided with a cylindrical stem **10**, which is passed through the end wall of a cylinder **11** attached to the end of a tube **12** of insulating material, which is coaxially mounted within the tube **5**. The cylinder **11** is provided with a piston **13**, which is mounted on the stem **10** of the switching contact **9** and is adapted to be moved freely through a certain distance in axial direction. The free movement of the piston is limited on one side by axially extending ribs **14** formed on the stem **10** and on the other side by a head of the stem. This head is constructed as a bushing contact **15**, which is engaged by the end **16** of a switching rod **17** when the circuit breaker is in its closed condition. The ribs **14** serve also to center the stem **10** in the cylinder **11** and to guide the movable switching contact **9**. The piston **13** is loaded by a compression spring **18** and is urged by the latter towards a position, in which the piston engages with a part **13*a*** having a reduced diameter a fitting opening **19** in the end wall of the cylinder. In this position the piston abuts against ribs **14**.

The circuit breaker is constructed, in such a manner, that the smaller diameter of the conical contact area **20** or seat between the fixed switching contacts **6** and the movable switching contact **9** is greater than the diameter of the opening **19** or the diameter of the smaller piston area **13*a*** of the stepped piston **13**. The result thereof is that, when extinguishing gas under pressure is supplied to the arcing compartment **8** through the space **21**, the force with which the movable switching contact **9** is pressed against the seat of the fixed switching contact **6** is greater than the force exerted by the extinguishing gas on the smaller piston area **13*a***. When the force exerted

on the piston 13 becomes greater than the pressure of the spring 18 the piston is lifted but the switching contact 9 remains pressed against the fixed contact 6.

As soon as the piston 13 has left with its part 13*a* of reduced diameter the opening in the wall of the cylinder, so that the part of greater diameter of the piston is exposed to the pressure of the extinguishing gas, and the piston engages the head and bushing contact 15 the switching contact 9 is lifted from the seat of the fixed switching contact 6 and the circuit is interrupted. When the discharge opening 7 is opened the extinguishing gas escapes with force from the arcing compartment 8 through the gap between the separated contacts 6 and 9 and it extinguishes the produced arc. Immediately after the arc has been blown out the switching rod 16, 17 is pulled upwards and the circuit breaker is brought into its open condition. Thereafter the supply of extinguishing gas is stopped and the spring 18 urges both the piston 13 and the switching contact 19 back into their positions in which the switching contact 9 engages the seat 20 of the fixed switching contact 6. Thus the spring 18 serves also to generate the contact pressure in the closed condition of the circuit breaker.

What I claim is:

1. A gas-blast circuit breaker comprising in combination an arcing compartment adapted to be supplied with compressed extinguishing gas, mounted in said compartment a switching contact having an opening for the discharge of extinguishing gas from said compartment and a second switching contact cooperating with the first mentioned contact both electrically and as a valve in order to open and to close said discharge opening, one of said cooperating switching contacts being mounted for movement against spring pressure in a switching-off direction, a cylinder having one end in communication with said arcing compartment, a piston slidably mounted in said cylinder and adapted to drive said movable switching contact away from the other switching contact and a lost motion connection provided between said piston and said movable switching contact, said piston having a reduced portion adapted to engage a part of the cylinder chamber, which part has a correspondingly reduced diameter and is in permanent communication with the arcing chamber, said lost motion connection permitting the piston, which during the switching-off operation is exposed to the pressure of the gas in the arcing compartment first with its reduced portion and thereupon with its portion of greater diameter and is moved against spring pressure at least during the first part of its stroke, to be connected with the movable switching contact only after it has left the part of reduced diameter of the cylinder chamber, characterized in that the greatest diameter of the annular contact area between the two cooperating switching contacts is smaller than the diameter of said piston portion having the greater diameter and the smallest diameter of the annular contact area between the two cooperating switching contacts is greater than the diameter of the reduced piston portion.

2. A gas-blast circuit breaker as claimed in claim 1, including an abutment on the switching contact adapted to be moved by the piston during the switching-off operation, a spring biasing said piston against said abutment in a direction to keep said movable switching contact pressed on the other switching contact when the circuit breaker is in its closed position.

3. In a fluid blast circuit breaker including an arcing chamber having a fixed discharge nozzle contact and a pressure operated movable contact cooperating therewith, a cylinder in said arcing chamber having a passageway providing communication with the arcing chamber, a piston reciprocable in the cylinder and arranged with only a first effective area of reduced diameter in permanent communication with the arcing chamber through said passageway and having a second larger effective area with a greater diameter, a lost-motion connection between the piston and the movable contact, a single resilient means biasing the piston in a fluid pressure resisting direction into a seated position closing said passageway and cooperating with the piston in biasing the movable contact in a direction toward a seated position engaging and closing the nozzle contact, means for selectively introducing fluid pressure into said arcing chamber, and the greatest diameter of an annular seating area defined by the two cooperating contacts being smaller than the greater diameter of said piston and the smallest diameter of said seating area being greater than the reduced diameter of the piston.

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