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DEVICE FOR AIR BLAST CIRCUIT BREAKER

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FIG. 1.

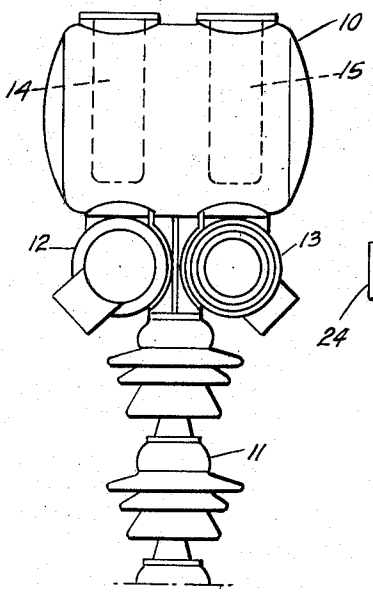
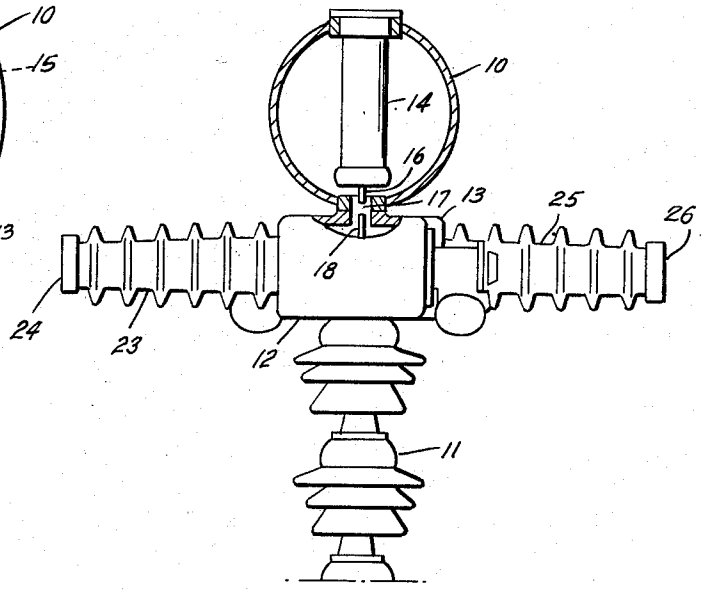


FIG. 2.



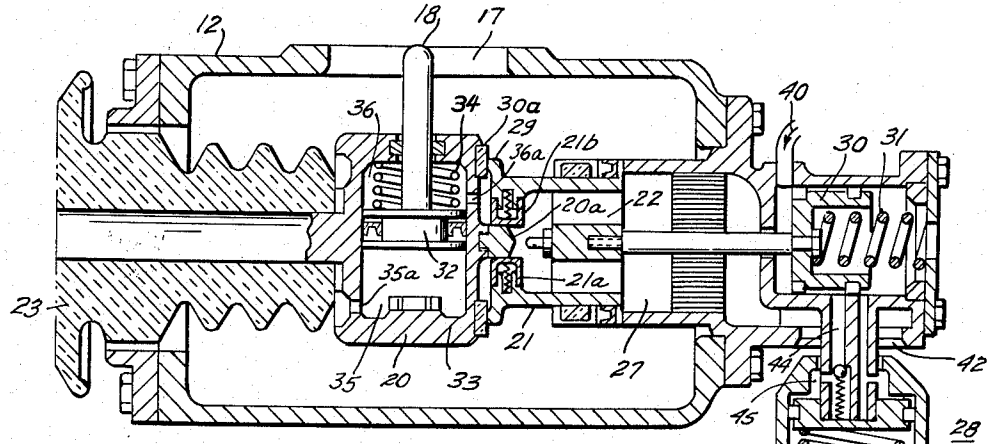


FIG. 3.

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DEVICE FOR AIR BLAST CIRCUIT BREAKER

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1 Claim. (Cl. 200—148)

My invention relates to air blast circuit breakers which include main interrupting contacts and auxiliary contacts for a resistor connected in parallel with the main interrupting contacts wherein the resistor housing within the compressed gas housing, the contacts being arranged so that an air blast first passes the resistor contacts and thereafter passes the main interrupter contact during interrupter operations.

Air blast circuit breakers are well known to the art wherein the contact means serving the interrupting function is contained within a conductive housing which contains sufficient compressed air for at least one interruption operation. A blast valve is opened during the separation of the interrupter contacts to permit an air blast to move past the separating contacts. To control the contact voltages during contact operation it is common to arrange a resistor in parallel with the main interrupter contact where the resistor is provided with auxiliary contacts which normally connect the resistor in parallel with the main interrupter contacts and disconnect the resistor after the main contacts disengage.

Several arrangements have been proposed in the prior art whereby blast air is directed at the resistor contacts to aid in the extinguishment of any small arc that may be drawn by these contacts. The present invention provides a novel arrangement for the resistor and its contacts whereby the resistor is arranged within the gas filled container to achieve a substantial saving in space while the resistor contacts are arranged upstream of the main interrupter contact. Thus, air blast first flows past the resistor contacts and thereafter through the main contacts. Hence, an air blast is already established when the resistor contacts are opened after the main contacts open. Moreover, and to further aid in the efficiency of extinguishing the arc drawn at a resistor contact, the contacts are placed immediately adjacent the inlet opening between the interruption chamber containing the main contacts and the main pressure gas container.

Accordingly, a primary object of this invention is to provide a novel interrupter structure for high voltage circuit breakers.

Another object of this invention is to provide a novel gas blast interrupter structure wherein resistors are carried within the high pressure gas container.

A further object of this invention is to provide a novel arc extinguishing structure using high pressure gas wherein resistor contacts are upstream of main interruption contact and the resistor is contained within the high pressure housing.

These and other objects of the present invention shall readily become apparent after reading the following description of the accompanying drawings in which:

FIGURE 1 shows a side plan view of a circuit breaker constructed in accordance with the present invention.

FIGURE 2 is a side view of FIGURE 1 partially in cross-section to illustrate the manner in which the resistors are carried within the gas containing chamber.

FIGURE 3 is a cross-sectional view of the interrupting chamber of FIGURES 1 and 2.

Referring now to FIGURES 1 and 2, a high pressure gas container 10 of conductive material is supported by a single pillar insulator 11 with respect to a ground support structure. The high pressure gas container 10

carries a first and second interrupter chamber 12 and 13 at the bottom thereof in the manner illustrated where each communicates with container 10.

Two resistors 14 and 15 are then mounted within container 10 in the novel manner illustrated in FIGURES 1 and 2 where resistor 14 operates in conjunction with interrupter 12 while resistor 15 operates in conjunction with interrupter chamber 13. That is to say, resistor 14 is connectable in parallel with the main contacts of interrupter 12 while the resistor 15 is connectable in parallel with the main contacts of interrupter chamber 13.

As is illustrated in FIGURE 2, the resistors such as resistor 14 have their upper end mechanically and electrically secured to conductive container 10 while the lower end of each of the resistors is terminated by a stationary contact such as stationary contact 16 of resistor 14 of FIGURE 2. Stationary contact 16 as well as a similar stationary contact of resistor 15 is disposed adjacent the inlet opening of its respective interrupter chamber 12 or 13. Thus, as shown in FIGURE 2, stationary contact 16 is disposed adjacent inlet opening 17 of interrupter chamber 12. The interrupter chamber 12 then has a movable contact such as contact 18 of FIGURE 2 which is movable into and out of engagement with respect to contact 17 so as to connect and disconnect resistor 14 in parallel circuit relationship with respect to the main contacts contained within interrupter 12. In a similar manner, contact structure of this type is also provided for interrupter chamber 13.

FIGURE 3 illustrates interrupter chamber 12 in cross-section and is identical in structure to interrupter chamber 13. Referring now to FIGURE 3, interrupter chamber 12 carries a main interrupter contact structure which includes a stationary contact 20 and a movable contact 21 which is movable into and out of engagement with respect to stationary contact 20 and has a central channel extending through.

The actual contact engagement between movable contact 21 and stationary contact 20 occurs between central stationary contact extending portion 20*a* and a plurality of contact fingers such as contact fingers 21*a* and 21*b* carried by movable contact 21 which are, for example, spring biased toward engagement with extension 20*a*.

The stationary contact 20 is carried at the end of an insulator 23 which is secured to the conductive housing of interrupter chamber 12 in the manner illustrated whereby, a conductor extending through insulator 23 serves a terminal 24 as shown in FIGURE 2. In a similar manner, the stationary contact container within housing 13 is carried by insulator 25 of FIGURE 2 and provides a terminal 26 at the end of insulator 25 whereby terminals 24 and 26 include the series connection of the main contacts contained within interrupters 12 and 13. It is to be noted that the conductive housing of chambers 12 and 13 are connected to the conductive material of chamber 10 to complete this series connection.

Returning to FIGURE 3, the outlet channel 22 within movable contact 21 is normally in communication with external air through channel 27 and stop valve 28. When the movable contact 21 is in the closed position shown in FIGURE 1, compressed air within container 10 and chamber 12 is prevented from flowing out of the chamber 12 by providing the movable contact 21 with an annular cup-shaped portion 29 which is secured against a resilient disc 30*a* carried in stationary contact 20.

Movable contact 21 is then connected to a piston 30 and is held in the normally closed position by means of a biasing spring 31 which biases piston 30 to the left and thus biases movable contact 21 to its engaged position. The movable contact 18 which will cooperate, as indicated in FIGURE 2, with contact 16 of resistor 14 is then carried by piston 32 which is carried within cylinder

33 formed within the stationary contact 20. Contact 18 is normally biased toward its lower and contact disengaged position by the biasing spring 34. Piston 32 divides cylinder 33 into two volumes. A first volume 35 is below the piston 32 and is in permanent communication with the interior of chamber 12 by means of the orifice 35*a*. The second volume 36 is above the piston 32 and is either connected to the interior of the chamber 12 or the external air. That is to say, volume 36 will be connected to the open air through orifice 36*a* when the movable contact 21 is engaged as shown and is connected directly to the high pressure air within container 12 when the movable contact 21 moves to the right and to its disengaged position.

So long as the main movable contact 21 is in the closed position the auxiliary contact 18 will be in its upper engaged position since volume 35 will be filled with the high pressure gas within container 12 which is sufficient to overcome the bias of spring 34. Moreover, the volume 36 is in communication with open air through the outlet channel 22, channel 27 and the open stop valve 28 whereby the only forces acting on piston 32 are the compressed air forces underneath piston 32 and the spring 34 on the top of piston 32.

The main contact 21 is moved to the disengaged position when high pressure air is applied to conduit 40. The application of high pressure air to conduit 40 will move piston 30 to the right and thus move the contact 21 to the right and toward the disengaged position. The high pressure air within container 12 as well as container 10 will then move through the outlet channel 22 with blast type action and thence through the channel 27 and the open valve 28.

Blast valve 28 includes a valve member 41 which moves with respect to a valve seat 42. Valve member 41 is normally biased to the open valve position by the biasing spring 43. However, when the piston 30 moves to the right, channel 44 which communicates with volume 45 within member 41 is uncovered so that volume 45 is subject to high pressure which moves member 41 upwardly toward seat 42 to cut off the blast action. It will be noted that this blast action cut off is achieved only after contact 21 has moved some predetermined distance away from the stationary contact 20.

Before movable contact 21 moves toward the disengaged position, the orifice 36*a* is in communication with the open air through valve 42 and prior to the time that member 41 moves into this valve 42. When movable contact 21 moves to the right, the compressed air within container 12 can communicate with volume 36 through orifice 36*a* whereby the pressure on the opposing surfaces of piston 32 begins to equalize. When the pressure on the upper surface of piston 32 reaches some predetermined value, the piston 32 moves downwardly to withdraw auxiliary movable contact 18 from its cooperating contact such as contact 16 of FIGURE 2. When the piston 32 reaches its lowermost point it will be noted that pressures on either side of the piston are substantially equal so that the contact 18 is held in a disengaged position by virtue of the spring 34.

At the same instant that the main contact 21 is opened the blast air from container 1 begins to flow out through channel 22. This compressed air is taken past the auxiliary contacts 18 and 16 which remain closed for some short interval determined by the size of orifice 36*a*, whereby the damping resistance circuit formed by resistor 14,

for example is open only after the arc drawn between contacts 21 and 20 is extinguished. The size of orifice 36*a* is designed in conjunction with the operation of stop valve 28 whereby contact 18 is moved toward its disengaged position while there is still a blast action proceeding but after the extinguishment of the arc between contacts 20 and 21. Thus, when contact 18 is operated to its disengaged position a flow of compressed air will move through the contact to aid in the interruption of an arc which may be drawn between contact 18 and its stationary cooperating contact 16. Moreover, and even after the stop valve 28 has closed, at least a small blast continues past contact 18 due to the replenishment of air from container 10 to container 12.

In order to now close the circuit breaker after the circuit breaker has been opened conduit 40 is connected to the open air whereby pressure on the right of piston 30 is relieved and the piston is moved to the left under the biasing action of spring 31 to close contacts 20 and 21. During this movement of piston 30 channel 44 is covered and channel 47 is opened to the external air through the cylinder which contains piston 30. This permits the reopening of valve member 41 under the action of spring 34. At the same time orifice 36*a* is sealed with respect to the interior of chamber 12 and is exposed to open air through the valve 28 whereby the compressed air within chamber 36 is released and the contact 18 is moved to the engaged position shown in FIGURE 3 after the contacts 20 and 21 have engaged.

In the foregoing, I have described my invention only in connection with preferred embodiments thereof. Many variations and modifications of the principles of my invention within the scope of the description herein are obvious. Accordingly, I prefer to be bound not by the specific disclosure herein but only by the appended claim.

I claim:

An air blast circuit breaker comprising an electrically conductive pressure air container, an interrupter chamber secured to said container, said interrupter chamber having a free volume substantially less than that of said pressure air container, a restricted inlet opening from the container into the chamber, said container thereby holding the main body of pressure air contained by said container and said chamber together, insulating support means for supporting said container and insulating it from earth, said interrupting chamber having a first pair of cooperable contacts therein, a resistor arranged in said container, a second pair of cooperable contacts in said container connected in series with said resistor, said second pair of contacts and resistor being connected in parallel with said first pair of contacts, said second pair of contacts being arranged immediately adjacent to said inlet opening, said interrupter chamber having a blast valve therein for permitting a blast of air from said container successively past said pairs of cooperable contacts.

References Cited in the file of this patent

UNITED STATES PATENTS

3,018,352	Schulz	Jan. 23, 1962
3,043,940	Leeds	July 10, 1962

FOREIGN PATENTS

568,382	Belgium	June 30, 1958
933,819	Germany	Oct. 6, 1955
1,241,059	France	Aug. 1, 1960
1,241,099	France	Aug. 1, 1960