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AIR BLAST CIRCUIT BREAKER WITH AUXILIARY ENCLOSED HOUSING

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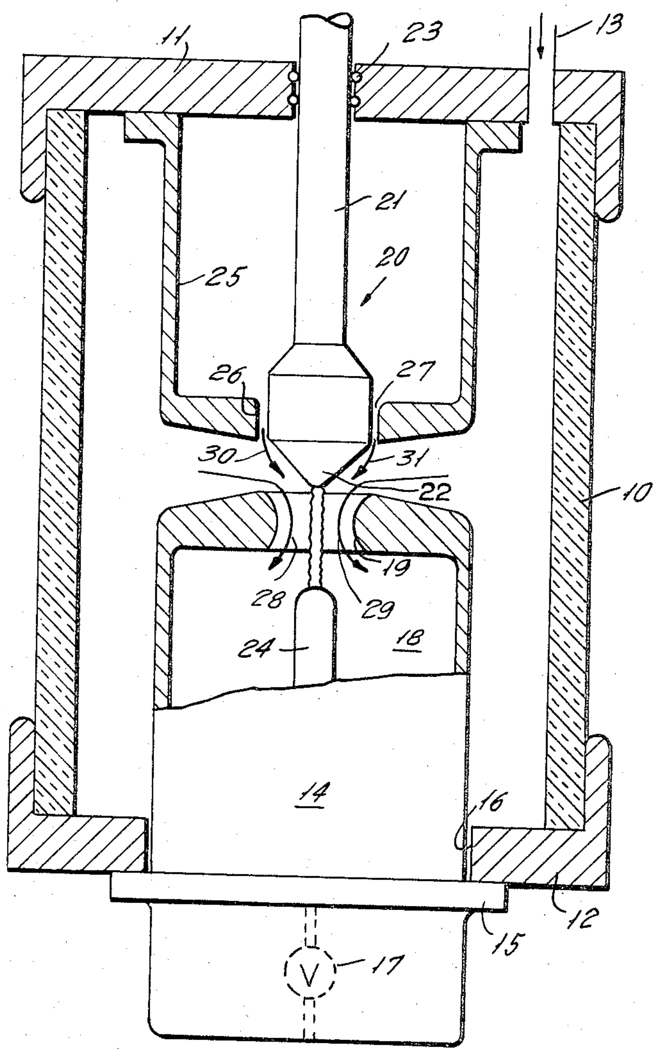

INVENTOR.
HAAKON FORWALD
BY
Bailey, Stephens & Huettig

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AIR BLAST CIRCUIT BREAKER WITH AUXILIARY ENCLOSED HOUSING

Haakon Forwald, Grottvagen 31, Ludvika, Sweden, assignor to Allmanna Svenska Elektriska Aktiebolaget, Vasteras, Sweden, a corporation of Sweden

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ABSTRACT OF THE DISCLOSURE

An air blast circuit breaker has inside a housing filled with compressed air an auxiliary enclosed housing with an opening opposite to an opening in the fixed contact. The movable contact passes through the opening in the auxiliary housing leaving an annular opening therebetween which permits a flow of cool air from the auxiliary housing after the blast valve is opened.

This invention relates to air blast circuit breakers, and more specifically relates to the provision of an auxiliary chamber within the main container of an air blast circuit breaker which auxiliary container is normally filled with compressed air, the auxiliary chamber providing a flow of relatively cool air toward the end of the interrupting operation.

Air blast circuit breakers are well known to the art, and commonly contain a main pair of cooperating contacts positioned within a container which is filled with compressed air. One of the contacts is generally a fixed contact which has an opening therethrough which communicates with a blast valve which, in turn, communicates with the external atmosphere. Thus, when the movable contact is moved to a disengaged position, the blast valve is opened so that a strong blast of compressed air flows through the opening in the movable contact and out of the chamber, thereby assisting in cooling and extinguishing the arc.

In this operation, the arc is generally extinguished at zero current. At this time, however, the air flow through the arc and out of the chamber is somewhat diminished, and its temperature is very high since this air has been exposed to the hot arc. Therefore, the air passing through the open contacts at zero current may not have sufficient dielectric strength to prevent restrike, or to withstand the recovery voltage across the contacts.

The principle of the present invention is to provide an auxiliary chamber within the main container which has a small opening therein in communication with the area immediately adjacent the opening in the stationary contact. Therefore, during the main portion of the air blast cycle, relatively little air will be withdrawn from the auxiliary container and through the arc and out of the container, since there is a relatively equal pressure within the main body of the container and in the auxiliary chamber. However, toward the end of the air blast operation, and when zero current is reached, the pressure within the main body of the container will have decreased. Therefore, a relatively high rate of flow of air out of the auxiliary chamber will occur being that this air is relatively cool with respect to the remaining air in the body of the container, since it has not been directly exposed to the arc. Thus, toward the end of the cycle, an additional supply of cool air is provided which passes through the arcing area, thus increasing the dielectric strength of the air between the separated contacts and improving the probability that the separated contacts will

successfully withstand the recovery voltage across the contacts.

Accordingly, a primary object of this invention is to improve the interrupting capability of an air blast circuit breaker.

Another object of this invention is to provide an auxiliary source of cool air for passage through the arcing area of an air blast circuit breaker toward the end of the interruption operation.

Yet another object of this invention is to provide a relatively cool air flow through the open contacts of an air blast circuit breaker toward the end of the interruption operation.

These and other objects of this invention will become apparent from the following description when taken in connection with the accompanying drawing which shows a partial cross-sectional view of a typical interrupter of a high voltage air blast circuit breaker constructed in accordance with the present invention.

Referring now to the drawing, the interrupter structure is comprised of a main container or housing which includes an insulation cylinder **10** which has conductive end caps **11** and **12** secured to the opposite ends thereof in an air-tight manner.

A conduit **13** passes through the end cap **11** to provide high pressure air to the interior of the container. The bottom of the container carries a stationary contact structure **14** which has a flange **15** sealed across an opening **16** in the end cap **12**.

As schematically illustrated in the drawing, the stationary contact **14** is associated with a blast valve **17** which is operable to connect the interior space **18** of the stationary contact **14** to the external atmosphere in the usual manner.

The upper end of stationary contact **14** is provided with a nozzle opening **19** which is in communication with the interior of the main container. A movable contact **20** which is comprised of a contact rod **21** and an arcing contact tip **22** moves through an opening in end wall **11** and is in sealed relationship with respect thereto by virtue of suitable gaskets such as gasket **23**.

The movable contact **20** is shown in its disconnected position with respect to stationary contact **14**. Clearly, the rod **21** is movable downwardly so that the contact can seat on top of and within the walls of orifice **19**.

The stationary contact **14** is further provided with an arcing contact **24** so that the arc between the movable contact **20** and stationary contact **14** will strike from the arcing tip **22** to the arcing contact section **24**, as illustrated.

In accordance with the invention, an auxiliary closed chamber **25** is secured to the end cap **11** in a substantially air-tight manner as by brazing or any other suitable operation. The lower end of chamber **25** has an opening **26** therein which is relatively closely fitted about the end of movable contact **20**. That is to say, a small annular gap **27** is defined between the outer area of the lower portion of movable contact **20** and the opening **26**. Container **25** is substantially sealed except for this annular opening **27**.

The annular opening **27** is arranged to have a relatively small area with respect to the relatively large area opening of orifice **19**. The opening **27** is further arranged to have a relatively small area with respect to the effective area with which the opening **19** communicates with the rest of the container. That is to say, an annular inlet area is defined between the top of stationary contact **14** and the bottom of auxiliary container **25** which permits gas to flow from the remote regions of the container and toward the nozzle or orifice **19**. The opening **27** is specifically made to be relatively small with respect to this latter mentioned inlet area for nozzle **19**. It should also be noted that this opening **27** is purposely provided in relatively close proximity with respect to nozzle **19**.

In operation, and assuming that the contacts **20** and **14** are in their closed position, the blast valve **17** is opened simultaneously with the movement of the contact rod **21** toward the upper position shown. An arc is then struck between arcing contact sections **22** and **24**, and simultaneously therewith a strong blast of compressed air, illustrated by arrows **28** and **29**, flows from the main regions of the container through the nozzle **19**, thereby to cool the arc and aid in its extinction.

During this time, since the effective area **27** is so small, the compressed air within the chamber **25** will experience relatively little flow, indicated by arrows **30** and **31**. Toward the end of the interrupting cycle, however, the pressure within the main portion of the container will have decreased, while the temperature of the remaining air within the main container will be substantially increased by virtue of its direct exposure to the arc. The air within the auxiliary container **25**, however, remains cool with relation to the remaining air within the main portions of the container, since it is not directly exposed to the arc. Therefore, toward the end of the interrupting cycle, and when the pressure within the main body of the container has decreased, the relatively high pressure air still remaining within auxiliary container **25** will now be sucked toward the arc and through the nozzle or orifice **19**. That is to say, when the arc current approaches zero, the speed of the air through the nozzle **19** increases, while its static pressure decreases. This, in connection with the general pressure decrease in the container, creates a pressure differential between the interior of container **25** and the air pressure external of container **25**, thereby producing an increased quantity of cool air flowing through orifice **27** and toward orifice **19**, thereby cooling down the hot air flowing through nozzle **19**.

Therefore, the relatively cool air from the auxiliary container **25** will mix with the heated air from the remaining portions of the container so that a relatively cooler

flow of air will pass through nozzle **19** toward the end of the interrupting cycle, whereupon the dielectric strength of the air at that time is increased. Therefore, when zero current is reached, there is less likelihood of a restrike between the cooperating contacts due to the recovery voltage across the contacts.

Although this invention has been described with respect to its preferred embodiments, it should be understood that many variations and modifications will now be obvious to those skilled in the art, and it is preferred, therefore, that the scope of the invention be limited not by the specific disclosure herein, but only by the appended claim.

The embodiments of the invention in which an exclusive privilege or property is claimed are defined as follows:

An air blast circuit breaker comprising a housing filled with compressed air, a stationary contact, a movable contact movable into and out of engagement with said stationary contact, an opening in said stationary contact, a blast valve connected between said opening in said stationary contact and the atmosphere external of said housing, and an auxiliary enclosed housing within said housing; said auxiliary enclosed housing and said movable contact defining between them an annular opening; said annular opening being in close proximity to said opening in said stationary contact; said annular opening having a relatively small area in comparison to the area of said opening in said stationary contact whereby initial air flow through said opening in said stationary contact is mainly comprised of the air in said housing exterior of said auxiliary housing followed by a flow of cool air from said auxiliary housing.

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ROBERT S. MACON, *Primary Examiner.*