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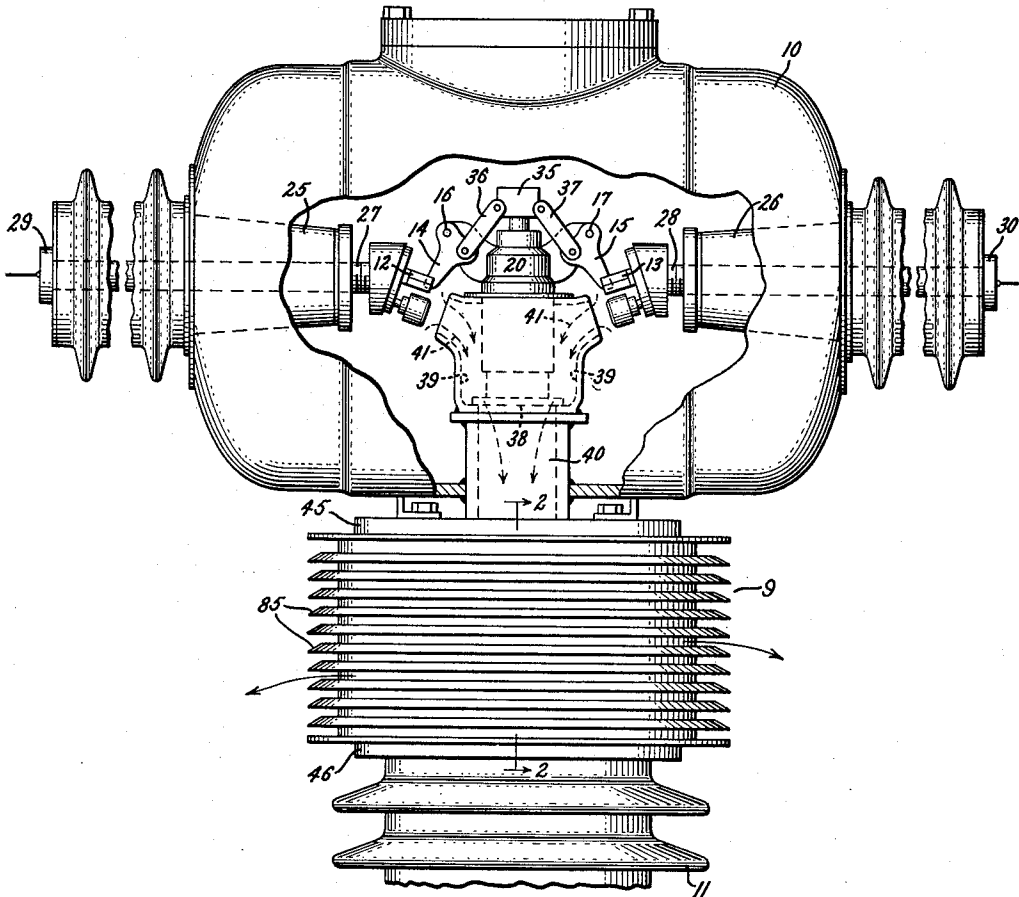
H. CHANG ET AL
GAS BLAST CIRCUIT BREAKER WITH NOISE-REDUCING
EXHAUST MUFFLER ASSEMBLY

3,134,876

Filed Oct. 2, 1961

2 Sheets-Sheet 1

FIG. 1.



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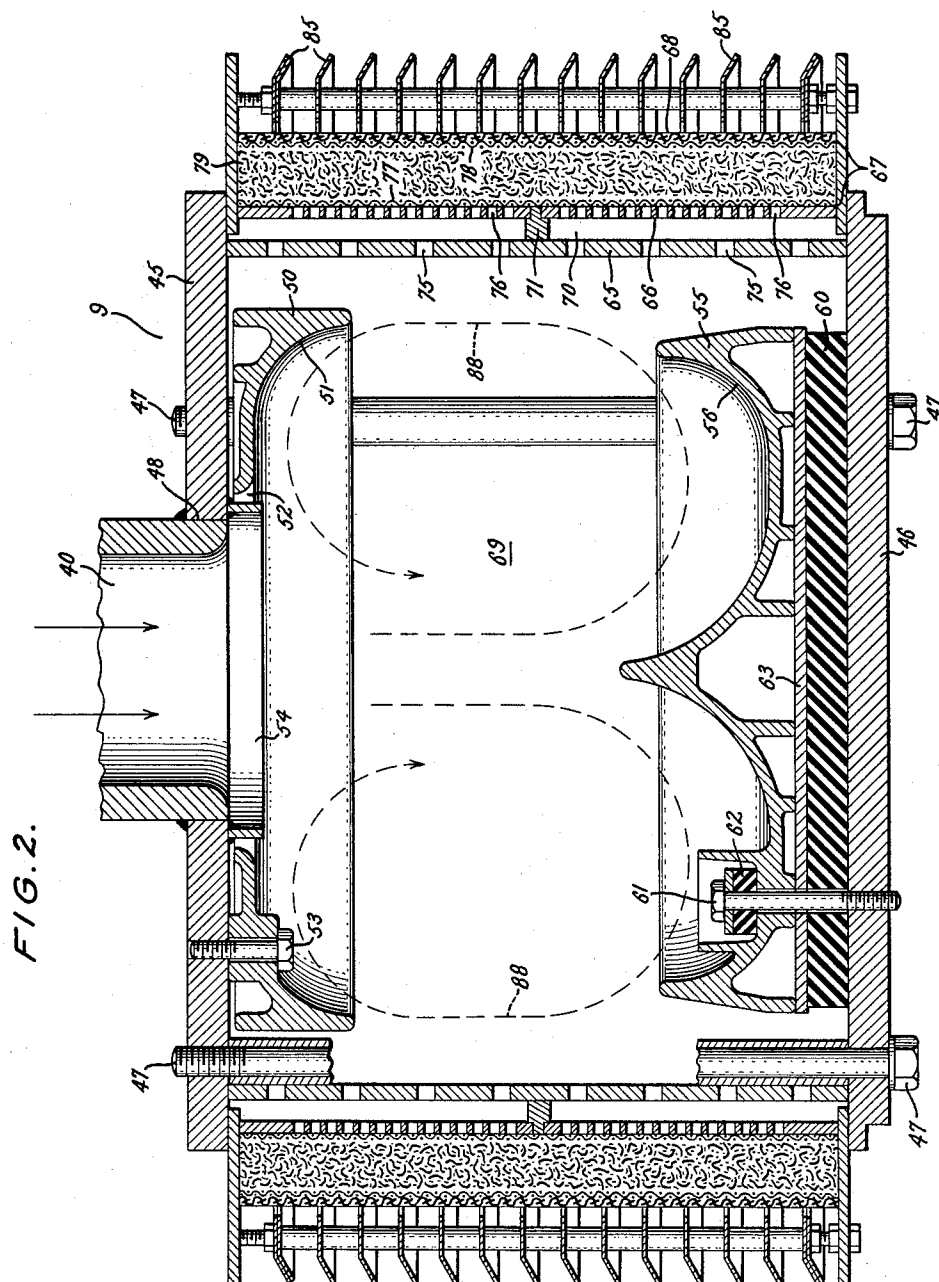
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GAS BLAST CIRCUIT BREAKER WITH NOISE-REDUCING EXHAUST MUFFLER ASSEMBLY

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9 Claims. (Cl. 200-148)

The present invention relates to a gas blast type of electric circuit breaker and, more particularly, relates to a muffler assembly for reducing the noises resulting from the flow of hot exhaust gases from the circuit breaker to the surrounding atmosphere.

In a gas-blast type of circuit breaker, circuit interruption is effected by causing a high speed blast of pressurized gas to flow for a short period through the usual arcing region of the breaker. This blast facilitates circuit interruption by cooling the arc and by cleansing the arcing region of hot metallic vapors and other highly heated arcing products. Upon leaving the arcing region, the highly heated gases are discharged to the surrounding atmosphere in a short and intense burst. In most prior gas blast circuit breakers, the heated gases are then flowing at high speed, and the result is a loud noise, which in many cases is objectionable.

An object of our invention is to provide an improved exhaust muffler that is capable of greatly reducing the amount of noise resulting from operation of the circuit breaker.

Another object is to provide a muffler of this nature which is highly compact and does not create an objectionable amount of back pressure that could impair the ability of the gas blast to perform its intended arc-extinguishing function.

Another object is to provide a muffler, which although compact and efficient in reducing noise, allows gases to be dissipated therefrom rapidly enough to permit an unimpeded, closely-succeeding operation of the circuit breaker.

In the muffler of our invention, the exhaust gases are introduced into a chamber from which they are discharged in a controlled manner through a large number of spaced-apart openings in the walls of the chamber. Another object of our invention is to distribute this flow generally uniformly between substantially all these openings so that excessive velocities do not occur through the openings in any localized region of the muffler.

In carrying out our invention in one form, we provide in a gas blast circuit breaker having an exhaust passage through which pressurized gases are exhausted after flowing through the arcing region of the circuit breaker, an exhaust muffler comprising a pair of end walls and a hollow enclosure extending axially of the muffler between the end walls to define a chamber internally thereof. The enclosure has perforations extending generally radially therethrough at spaced-apart locations about substantially its entire periphery and length for allowing exhaust gases to flow generally radially outward there-through. In one of the end walls there is provided an inlet to the expansion chamber that communicates with the exhaust passage for directing exhaust gases axially of the muffler towards said other end wall. Within the chamber there is provided means including a deflector on said other end wall for causing gases from the inlet to flow in a reverse axial direction along the internal wall of the enclosure after impinging against the deflector. This reverse axial flow helps to provide a more uniform distribution of flow through the perforations in the enclosure.

While the specification concludes with claims particularly pointing out and distinctly claiming the subject mat-

ter which may be regarded as the invention, the organization and method of operation, together with further objects and advantages thereof, may best be understood by reference to the following description taken in connection with the accompanying drawings in which:

FIG. 1 is a partially schematic side elevational view of a circuit breaker embodying one form of the present invention; and

FIG. 2 is an enlarged sectional view along the line 2-2 of FIG. 1.

Referring to the drawings and particularly to FIG. 1, the circuit breaker shown therein comprises a metallic tank 10 mounted upon a hollow insulating column 11 with an exhaust muffler assembly 9 of the present invention therebetween. The tank is at a high voltage with respect to ground, and the insulating column 11 serves to electrically isolate the tank from ground as well as to support the tank. The tank 10 is normally filled with pressurized gas that serves as an arc-extinguishing medium as will hereinafter be described. The basic circuit breaker structure within the tank generally corresponds to that disclosed in detail and claimed in U.S. Patent No. 2,783,338—Beatty, assigned to the assignee of the present invention. The structure of the circuit breaker will be described herein only to the extent believed necessary to convey an understanding of the present invention that relates to the exhaust muffler assembly. Reference may be had to the Beatty patent if a more detailed description is desired of the circuit breaker.

Referring now to the structure within the tank 10, there are two pairs of contacts disposed therein. One pair of contacts comprises a stationary contact 12 and a movable contact 14. The other pair of contacts comprises a stationary contact 13 and a movable contact 15. The movable contacts 14 and 15 are mounted on two stationary pivots 16 and 17 carried by a central metallic support 20 that is mechanically and electrically connected to the tank 10. The stationary contact 12 is shown mounted on the inner end of a lead-in bushing 25 projecting into the tank through its left-hand end wall and providing an electrical connection through a conductive stud 27 between the stationary contact 12 and a terminal 29 of the circuit breaker. The other stationary contact 13 is shown mounted on a bushing 26 projecting into the tank through its right-hand end wall and providing a connection through a conductive stud 28 between the other terminal 30 of the circuit breaker and the contact 13. The lead-in bushings 25 and 26 insulate the contacts 12 and 13 from the tank 10 when the circuit breaker is open.

For imparting opening or closing motion to the movable contacts 14 and 15, a common driving member in the form of a reciprocal crosshead 35 is provided. The movable contact 14 is coupled to this crosshead 35 by means of a link 36 pivotally connected at its respective opposite ends to the crosshead 35 and the movable contact 14, whereas the movable contact 15 is coupled to the crosshead 35 by means of a second link 37 pivotally connected at its respective opposite ends to the crosshead 35 and the movable contact 15. Upward movement of the crosshead 35 causes the lower ends of the movable contacts 14 and 15 to separate from their respective stationary contacts 12 and 13, and move into an open position; whereas return movement of the crosshead 35 returns the movable contacts 14 and 15 from the open position to a closed position.

For controlling the motion of the crosshead 35 so as to effect opening and closing of the movable contacts in this manner, a pneumatic operating mechanism is provided within the central metallic support 20. The details of this operating mechanism form no part of the

present invention and therefore will not be described in this application. Preferably, however, the operating mechanism is of the type disclosed and claimed in the aforementioned Beatty Patent 2,783,338.

For extinguishing the arcs formed between the contacts upon opening of the circuit breaker, a blast of pressurized air is caused to flow through the arcing region. This blast of air is controlled by a normally-closed blast valve 38 mounted within the metallic support 20. When the blast valve 38 is lifted into its open position, communication is established between an exhaust passage 40 and the space within the tank 10 through exhaust orifices 39. This causes pressurized gas within the tank to flow through the arcing region into the exhaust passage 40 via paths generally indicated by the dotted line arrows 41 of FIG. 1. When circuit interruption is completed, the blast valve is returned to its closed position to terminate the gas blast. The blast valve and its control means are described in greater detail in the aforementioned Beatty patent. The gases flowing through the exhaust passage 40 are extremely hot inasmuch as they consist of arcing products or gases that have been heated by the arc. After passing through the exhaust passage 40, these hot gases enter the muffler assembly 9, from which they are discharged to the surrounding atmosphere in a manner which will soon be described in more detail.

Referring now to FIG. 2, a sectional view along the line 2-2 of FIG. 1 is shown of the exhaust muffler assembly 9. Upper and lower parallel plates 45 and 46 which are perpendicular to the axis of the exhaust passage 40 are arranged to receive suitable tie bolts there-through such as shown at 47 to clamp therebetween the respective elements that form the improved exhaust muffler assembly of the present invention. The upper plate 45 has a suitable central aperture 48 aligned with the exhaust passage 40 from the pressurized tank 10 of FIG. 1. An upper deflector 50 is secured to the upper plate 45 by a plurality of bolts such as shown at 53. The upper deflector has a centrally-located aperture 52 aligned with the exhaust passage 40 and a downwardly opening concave face 51 that surrounds the central aperture 52. A thin-walled ring 54 fits within the central aperture 52 in the upper deflector 50. The aligned apertures 48 and 52 and the ring 54 together define an inlet to the muffler assembly 9. Opposing the upper deflector 50 and spaced therefrom is a lower deflector 55 having an active surface 56 of a generally semi-toroidal form. Interposed between the lower deflector 55 and the lower plate 46 is a resilient buffer member 60 of rubber or the like secured to the lower plate 46 by a plurality of bolts, such as shown at 61, where each bolt has a resilient washer 62 disposed between its head and the lower deflector 55 to substantially isolate the lower deflector 55 from direct contact with the lower plate 46 of the assembly. Preferably, a thrust plate such as shown at 63 is positioned between the lower deflector 56 and the buffer 60 to more uniformly distribute the downward force transmitted to the buffer 60, as will soon appear more clearly.

The upper plate 45 and the lower plate 46 retain in a sandwich form a plurality of concentric cylinders 65-68 therebetween. These cylinders may be thought of as constituting a hollow enclosure for an expansion chamber 69 disposed internally thereof. The perforated cylinders 65 and 66 are radially spaced from each other to define a suitable acoustic chamber 70 therebetween. Suitable spacers 71 disposed between these two cylinders assure that the desired spacing is maintained. The inner cylinder 65 is provided with a plurality of perforations such as at 75 distributed over substantially its entire periphery and length. The intermediate or second cylinder 66 is also suitably perforated such as at 76, preferably with an increased total number of perforations having a reduced diameter as compared to those provided in the first cylinder 65. These perforations 76 are distributed over a

major portion of the periphery and length of the cylinder 66. Exhaust gases from the expansion chamber 69 will be discharged radially outward through the perforations in the two cylinders 65 and 66. Gases passing through the perforated second cylinder 66 will impinge upon a porous cylinder assembly 67 that is preferably formed, in accordance with one form of the present invention, of three distinct elements comprising the cylindrical reticulated members, or screens, 77 and 78 and a compacted filler 79 therebetween of copper wool or a similar substance that retains a porous quality when suitably compacted. The porous cylinder assembly 67 thus formed, further restricts the escaping exhaust gases that pass through the second perforated cylinder 66 and attenuates high frequency noise. In the form of the invention being described, an exterior porous cylinder 68 is positioned as shown adjacent to the periphery of the porous cylinder assembly 67 and may be formed from a porous material, such as loosely-woven cellulose fibers, to further attenuate noise. A plurality of vertically-spaced louvers 85, each of a generally annular form with a downwardly flared periphery, are shown positioned adjacent to but spaced from the periphery of the outer cylinder 68 to provide the muffler assembly with adequate protection against possible contamination from moisture. Where moisture contamination is no problem, the louvers 85 may be omitted.

Again referring particularly to FIG. 2, the operation of the exhaust muffler assembly 9 formed in accordance with the present invention provides that the hot exhaust gases released from the pressurized tank 10, shown by FIG. 1, will enter the exhaust muffler assembly 9 through the exhaust passage 40 and the muffler inlet 48, 52. The hot exhaust gases then flow axially of the muffler assembly in a downward direction and impinge directly upon the lower deflector 55, which reverses the direction of flow of the exhaust gases to a new direction that is generally 180° opposed to the entrance flow of the exhaust gases. A portion of the exhaust gases will thereafter impinge upon the upper deflector 50, and this results in flow again being reversed by approximately 180° from the previous direction. This path followed by the hot exhaust gases as their direction of flow is reversed by the deflectors is generally indicated by the dotted line arrows 88 of FIG. 2. While some of the exhaust gases are flowing repetitively over this dotted line path, some are also exhausting radially outward through the perforations of the inner cylinder 65 after traversing only a portion of this path.

The buffer member 60 in the present invention provides a substantial reduction in the noise and vibration that results from the sharp impact caused by the sudden axial flow of the exhaust gases into the exhaust muffler assembly 9 when the circuit breaker is opened. For example, in some circuit breakers, this sudden flow of exhaust gases produces a force of approximately 2000 pounds inasmuch as the escape velocity of the exhaust gases into the muffler assembly is 600 or 700 feet per second. By absorbing a substantial portion of this impact energy instead of allowing it to be transmitted directly to the lower metallic plate 46, the resilient buffer 60 effects additional noise reduction. The resilient washers 62 further isolate the lower plate from the effect of this impact by absorbing the rebound energy that is released from the buffer 60 when the gas force on the lower deflector 55 diminishes. The heads of bolts 61 may be thought of as stops for limiting this rebound motion and the resilient washers 62 may be thought of as being disposed between stops and the deflector 55.

The inner cylinder 65 is of a thick-walled construction so that it forms, together with the end walls 45, 46 at its opposite ends, a thick-walled housing. Because this housing is of a thick-walled construction, it is capable of confining within its interior much of the noise gen-

erated upstream therefrom and of thus impeding the transmission of such noise to the surrounding atmosphere.

To avoid detracting unduly from this noise-confining ability of the thick-walled construction and for other reasons soon to be explained, the number of openings 75 provided in the cylinder 65 is limited, at least in comparison to the number of openings provided in cylinder 66. The openings 75 that are provided, however, are distributed over substantially the entire periphery and length of the cylinder 65.

The exhaust gases pass radially outward through these openings 75, undergoing a generally isentropic expansion that results in a reduction in temperature. Thereafter, the exhaust gases enter the acoustic chamber 70, which has a further noise attenuating effect upon the gases. Subsequently, the gases pass through the second or intermediate perforated cylinder 66. Again a decrease in temperature results due to an isentropic expansion as the exhaust gases pass through the perforations 76 of the second cylinder 66. The acoustic chamber 70 serves the additional purpose of further dispersing the gas and distributing the pressure more uniformly over the entire surface area of the intermediate cylinder 66 so that a generally uniform distribution of flow is effected through the openings in cylinder 66. It is to be noted that the intermediate cylinder 66 has more openings therethrough than the inner cylinder 65, and this contributes to a desirable reduction in the gas velocity through the openings 76 and to a more uniform rate of flow through the openings 76. Both of these factors help to lessen the amount of noise resulting from the passage of gas through the openings 76.

Insofar as permitted by manufacturing and mechanical strength considerations, it is desirable that the effective exhaust area through the cylinder 66 should be provided by perforations as close together as possible and as small as possible. This appears to result in a cancellation of flow turbulence in the exhaust gases, which effects a reduced noise level. More specifically, noise is generated by jets of exhaust gases shearing still air about the periphery of each perforation and the periphery of each related jet. Having the perforations close together counteracts such noise generation by eliminating this still air or at least reducing it and thus reducing the effect of the jets shearing still air. In some cases, it might be desirable to place an intermediate cylinder between the cylinders 65 and 66, and these same considerations would apply to such an intermediate cylinder.

After leaving the acoustic chamber 70 through the openings 76, the exhaust gases impinge upon the porous cylinder assembly 67 which contains the tightly packed copper wool 79 or a similar substance to provide further diffusion of the exhaust gases and to attenuate flow noises that may have escaped through the prior components of the muffler assembly. This attenuation is maximized when the compacted filler 79 of copper or similar substance is densely packed between the reticulated elements or screens 77 and 78. The surface of the copper wool adjacent to the perforated intermediate cylinder 66 becomes pocketed by the impinging jets of exhaust gases passing through the perforations 76 of the intermediate cylinder. These pockets, not shown, contribute to reduction of the noise level of the escaping exhaust gases.

As previously stated, in the form of the invention being described, an exterior porous cylinder 68 formed from loosely-woven cellulose fibers or a similar porous substance is positioned about the external periphery of the exhaust muffler assembly 9. This cylinder has been found most efficient in attenuating the higher frequency components of the noise. Further, should the exhaust muffler assembly be exposed to the elements, as previously discussed, a plurality of downwardly-flared louvers such as shown at 85 may be positioned adjacent to and spaced from the external periphery of the muffler assembly 9 to restrict the entry of moisture. Eventually, all of the ex-

haust gases are discharged radially outward through the perforations of the inner cylinder 65.

An important purpose of the deflectors 50 and 55 is to prevent the radial flow through the inner cylinder 65 from being concentrated in any localized area of the cylinder, or, in other words, to more uniformly distribute this radial flow among all of the perforations 75 in the cylinder 65. By providing for a more uniform distribution of this radial flow, the velocity of the gas in traveling through the radially-outer portion of the muffler in any given area can be limited to a value low enough to prevent the generation of excessive noise. Generally speaking, the greater the velocity through a given perforation or opening, the greater will be the amount of noise generated.

The deflectors perform this important purpose by effecting a more uniform distribution of the pressure within the internal space of the muffler and also by causing the exhaust gases to flow generally parallel to the inner surface of the cylinder 65 prior to being discharged radially-outward through the perforations 75. This pattern of flow has been found to contribute materially to effecting a more uniform distribution of radial flow throughout the entire perforated surface area of the inner cylinder 65. For example, in tests made without the lower deflector 55, it was found that there was an excessive concentration of flow through those apertures 75 located near the bottom of the cylinder 65. This excessive flow through the apertures 75 near the bottom of the cylinder 65 tends to cause the gas flowing through the outer portion of the muffler in the region adjacent its bottom to travel at an excessive velocity that generates excessive noise.

By cooling the exhaust gases discharged from the circuit breaker, the muffler serves the additional functions of suppressing the ejection of flames from the circuit breaker and of preventing possible flashovers that could occur if hot ionized gases are permitted to enter regions of high dielectric stress.

Another principle involved in the operation of our muffler is that we transiently store a certain amount of gas within the cylinder 65 while the blast valve 38 is open and thus prolong the discharge through the muffler over a longer period than would occur in the absence of such storage. The desire to store some of this gas on a transient basis is another factor accounting for our limiting the number of openings provided in the inner cylinder 65. By prolonging the discharge over a longer period of time than the time that the blast valve is open, we can discharge the gas through the openings in the muffler more slowly. The slower this discharge, the less noisy it will be. But there are certain limitations which must be observed. One of these is that the gases must be removed quickly enough to prevent an objectionably high back-pressure from building up during the interrupting operation. Such back-pressures could impede the gas blast in its flow through the arcing region and this could impair the interrupting ability of the circuit breaker. The openings in the cylinder 65, and in the remainder of the enclosure, as well, are therefore designed to permit rapid enough escape to retard and limit the pressure buildup sufficiently to permit interruption to be completed without any significant impairment of the arc-extinguishing efficiency of the blast. Another limitation is that the gases must be removed quickly enough to permit the circuit breaker to operate two or more times in close succession without impairing the arc-extinguishing efficiency of the blast. Our muffler is capable of meeting this latter limitation since it allows the gases to escape quickly enough to reduce the pressure within the chamber 69 to atmosphere within about six or seven cycles of 60 cycle alternating current after the blast valve 38 is first opened. The shortest reclosing times ordinarily utilized in present-day practice are around twelve to fifteen cycles, so it will be apparent that the muffler completely dissipates the exhaust gases with an ample margin to spare. Enough holes must be present in the cylinder 65

to enable this latter performance requirement to be met.

As a further aid in limiting the pressure build-up within the cylinder 65, in order to prevent objectionable back pressures from developing, provision is made for cooling the gases while they are transiently stored within the cylinder 65. This cooling reduces the pressure of stored gas, thus lessening the back pressure effect. This cooling is achieved by forming the deflectors 50 and 55 of a metal capable of absorbing a relatively large amount of heat in a short time. Preferably, this material is copper or a copper alloy having a good thermal conductivity, for example, substantially higher than that of steel or iron. Also, the exposed surfaces of the deflectors are preferably left in a roughened condition to facilitate heat transfer to the deflectors. In certain cases, it may be desirable to locate a suitable heat exchanger (not shown) inside the chamber 69 to further facilitate cooling of the exhaust gas.

By causing our flow to be distributed generally uniformly throughout all the openings in a given cylinder, we are able to use a near-minimum number of holes of a given size without causing excessive flow through any of the holes. This enables us to use less holes than would otherwise be required, thus enabling us to reduce the diameter and length of the cylinders 65-68 forming the muffler enclosure. This, of course, results in a highly compact muffler.

As will be evident from the foregoing description certain aspects of the invention are not limited to the particular details of construction illustrated, and it is contemplated that other modifications and applications will occur to those skilled in the art. It is, therefore, intended that the appended claims shall cover such modifications and applications that do not depart from the true spirit and scope of the invention.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. In a gas blast circuit breaker having an exhaust passage through which pressurized gases are exhausted after flowing through the arcing region of the circuit breaker, a noise-reducing exhaust muffler comprising a pair of end walls and a hollow enclosure extending axially of the muffler between said end walls to define an expansion chamber internally thereof, said enclosure having perforations extending generally radially therethrough at spaced-apart locations about a major portion of the periphery and length of said enclosure for allowing exhaust gases to flow generally radially outward therethrough, an inlet to the expansion chamber in one of said end walls adapted to communicate with said exhaust passage for directing exhaust gases axially of the muffler toward said other end wall, means including opposed deflector members adjacent to each end wall for causing exhaust gases from said inlet to flow repetitively over a circulating path which extends between said two deflectors and has a portion extending generally parallel to the inner surface of said axially-extending enclosure in the region of said enclosure, whereby to provide for a more uniform distribution of flow through said perforations, said enclosure comprising a plurality of radially-spaced generally concentric cylinders extending between said end walls, each of said cylinders containing perforations through which exhaust gases from said chamber can flow.

2. In a gas blast circuit breaker having an exhaust passage through which pressurized gases are exhausted after flowing through the arcing region of the circuit breaker, a noise-reducing exhaust muffler comprising a pair of end walls and a hollow enclosure extending axially of the muffler between said end walls to define an expansion chamber internally thereof, said enclosure having perforations extending generally radially therethrough at spaced-apart locations about a major portion of the periphery and length of said enclosure for allowing ex-

haust gases to flow generally radially outward therethrough, an inlet to the expansion chamber in one of said end walls adapted to communicate with said exhaust passage for directing exhaust gases axially of the muffler toward said other end wall, means including opposed deflector members adjacent to each end wall for causing exhaust gases from said inlet to flow repetitively over a circulating path which extends between said two deflectors and has a portion extending generally parallel to the inner surface of said axially-extending enclosure in the region of said enclosure, whereby to provide for a more uniform distribution of flow through said perforations, said enclosure comprising a plurality of radially-spaced generally concentric cylinders extending between said end walls, each of said cylinders containing perforations through which exhaust gases from said chamber can flow, and an additional cylinder positioned about the outermost one of said perforated cylinders, said additional cylinder being of a porous construction that allows exhaust gases to escape therethrough.

3. In a gas blast circuit breaker having an exhaust passage through which pressurized gases are exhausted after flowing through the arcing region of the circuit breaker, a noise-reducing exhaust muffler comprising a pair of end walls and a hollow enclosure extending axially of the muffler between said end walls to define an expansion chamber internally thereof, said enclosure having perforations extending generally radially therethrough at spaced-apart locations about a major portion of the periphery and length of said enclosure for allowing exhaust gases to flow generally radially outward therethrough, an inlet to the expansion chamber in one of said end walls adapted to communicate with said exhaust passage for directing exhaust gases axially of the muffler toward said other end wall, means including opposed deflector members adjacent to each end wall for causing exhaust gases from said inlet to flow repetitively over a circulating path which extends between said two deflectors and has a portion extending generally parallel to the inner surface of said axially-extending enclosure in the region of said enclosure, whereby to provide for a more uniform distribution of flow through said perforations, said enclosure comprising a plurality of radially-spaced generally concentric cylinders extending between said end walls, each of said cylinders containing perforations through which exhaust gases from said chamber can flow, and an additional cylinder positioned about the outermost one of said perforated cylinders, said additional cylinder being of a porous construction that allows exhaust gases to escape therethrough, said additional cylinder comprising generally concentrically-positioned, radially-spaced reticulated cylinders and a quantity of compacted porous material disposed in the space between said reticulated cylinders.

4. In a gas blast circuit breaker having an exhaust passage through which pressurized gases are exhausted after flowing through the arcing region of the circuit breaker, a noise-reducing exhaust muffler comprising a pair of end walls and a hollow enclosure extending axially of the muffler between said end walls to define an expansion chamber internally thereof, said enclosure having perforations extending generally radially therethrough at spaced-apart locations about a major portion of the periphery and length of said enclosure for allowing exhaust gases to flow generally radially outward therethrough, an inlet to the expansion chamber in one of said end walls adapted to communicate with said exhaust passage for directing exhaust gases axially of the muffler toward said other end wall, means including opposed deflector members adjacent to each end wall for causing exhaust gases from said inlet to flow repetitively over a circulating path which extends between said two deflectors and has a portion extending generally parallel to the inner surface of said axially-extending enclosure in the region of said enclosure, whereby to provide for a

more uniform distribution of flow through said perforations, said enclosure comprising a cylinder having spaced-apart perforations through which jets of exhaust gas discharge radially outward, and an additional cylinder surrounding said first cylinder, said additional cylinder comprising a portion formed of a densely-packed metallic wool into which said gas jets discharge and form pockets.

5 5. The structure of claim 4 in combination with still another cylinder of non-metallic porous material surrounding the other cylinders for attenuating high frequency noise components.

6. In a gas blast circuit breaker having an exhaust passage through which pressurized gases are exhausted after flowing through the arcing region of the circuit breaker, a noise-reducing exhaust muffler comprising a pair of end walls and a hollow enclosure extending axially of the muffler between said end walls to define an expansion chamber internally thereof, said enclosure having perforations extending generally radially therethrough at spaced-apart locations about a major portion of the periphery and length of said enclosure for allowing exhaust gases to flow generally radially outwardly there-through, an inlet to the expansion chamber in one of said end walls adapted to communicate with said exhaust passage for directing exhaust gases axially of the muffler toward said other end wall, means including a deflector on said other end wall for causing gases from said inlet to flow in a reverse axial direction along the internal wall of said enclosure after impinging against said deflector, whereby to provide for a more uniform distribution of flow through said perforations, and a

resilient buffer disposed between said deflector and said other end wall for absorbing a portion of the impact resulting from the exhaust gases striking said deflector.

7. The structure of claim 6 in combination with a stop for limiting rebound motion of said deflector away from said other end wall when the force exerted by said exhaust gases diminishes, and second resilient buffer means between said stop and said deflector plate for absorbing the energy of said rebound motion.

8. The structure of claim 1 in which said perforations are sufficient in number and size to limit the pressure within said muffler to a level that does not substantially impair the arc-extinguishing ability of said pressurized gases as compared to a corresponding breaker without said muffler.

9. The structure of claim 1 in which at least one of said deflectors is made of a metallic material having a thermal conductivity substantially greater than that of steel so as to effectively reduce the pressure within said expansion chamber by cooling.

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