Aug. 18, 1942. E. W. BOEHNE 2,293,452

ELECTRIC AIR CIRCUIT BREAKER

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Fig. 1.

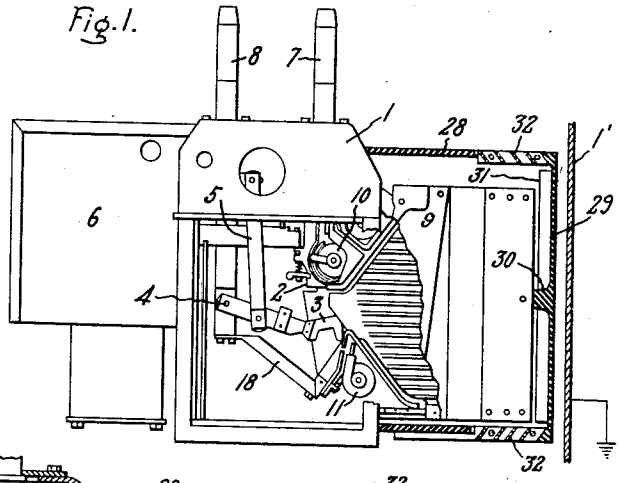


Fig. 2.

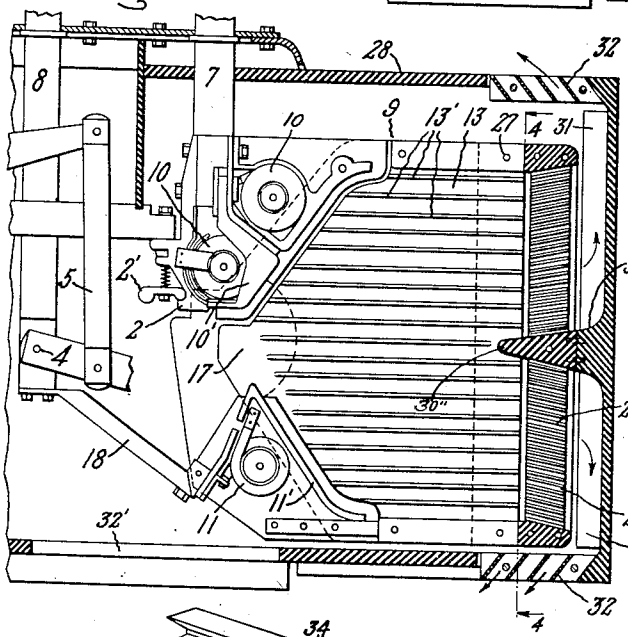


Fig. 3.

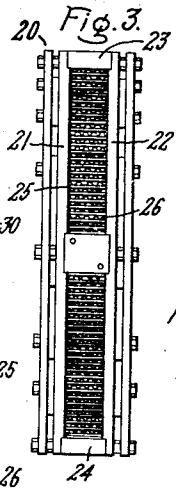


Fig. 4.

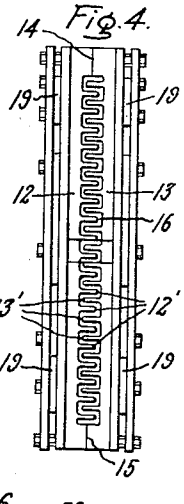


Fig. 5.

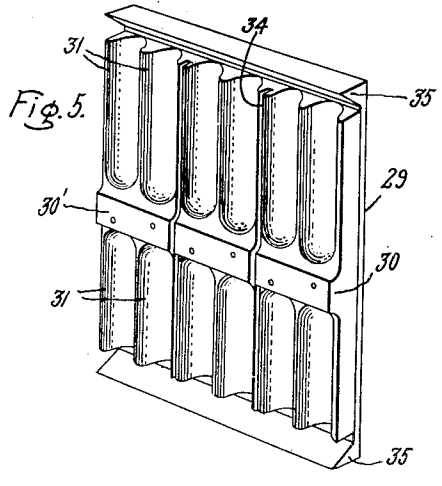
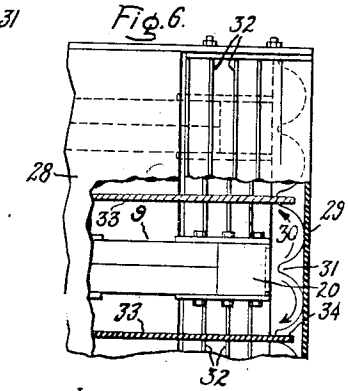


Fig. 6.



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ELECTRIC AIR CIRCUIT BREAKER

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Fig. 7

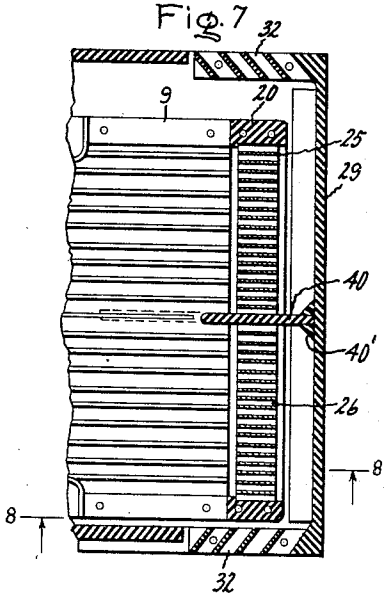


Fig. 9

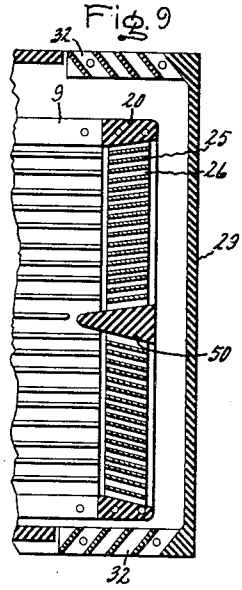


Fig. 8

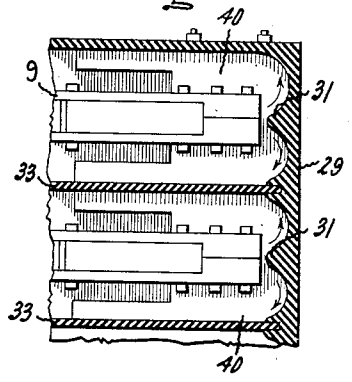
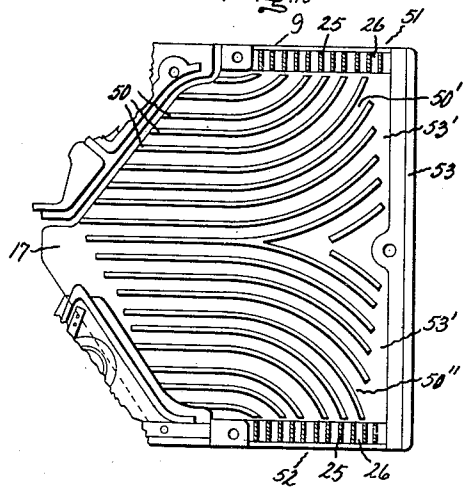


Fig. 10



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ELECTRIC AIR CIRCUIT BREAKER

Eugene W. Boehne, Drexel Hill, Pa., assignor to General Electric Company, a corporation of New York

Application August 1, 1940, Serial No. 349,220

19 Claims. (Cl. 200—144)

My invention relates to electric air circuit breakers, more particularly to air circuit breakers of the magnetic blowout type wherein a high current power arc is forced or directed into arc extinguishing structure in accordance with the circuit opening operation.

High current power arcs incident to a circuit overload or short circuit introduce a particular problem in the design of air circuit breakers for indoor use due to the large amount of highly heated arc gases generated within the short interval of arc interruption. This explosive-like generation of incandescent gases may cause serious injury and damage to adjacent operatives and equipment unless the gases are sufficiently cooled to an insulating state before being vented from the arc chute or breaker housing. This cooling, etc. however introduces another problem, i. e. possible reduction of arc interrupting capacity due to excessive back pressure, particularly where a compact design is required.

My invention has for its principal object the provision of improved compact gas deflecting and dissipating means for rendering harmless the arc and switching gases blown from the arc chute while maintaining high interrupting capacity of the circuit breaker and a high insulation level of the complete equipment.

My invention will be more fully set forth in the following description referring to the accompanying drawings, and the features of novelty which characterize my invention will be pointed out with particularity in the claims annexed to and forming a part of this specification.

Referring to the drawings, Fig. 1 is an elevational view, partly in section of an air circuit breaker embodying the present invention adapted for a well-known form of metal clad switchgear; Fig. 2 is an enlarged view, partly in section, of the arc extinguishing structure shown in Fig. 1; Fig. 3 is the exhaust end view of the arc extinguishing structure shown in Fig. 2; Fig. 4 is an end view of the arc chute extinguishing structure taken along the line 4—4 of Fig. 2; Fig. 5 is a view in perspective of gas deflecting means shown in Fig. 2; Fig. 6 is a top view, partly broken away, of the main housing and gas deflecting means for the arc extinguishing structure; Fig. 7 is a partial elevational view in section of a modified form of my invention; Fig. 8 is a similar plan view taken along the line 8—8 of Fig. 7; Fig. 9 is a partial elevational view in section of another form my invention may assume; and Fig. 10 is an elevational view of another arc chute structure embodying my invention with one side removed for inspection.

This application in a continuation in part of my application Serial No. 298,925, filed October 11, 1939 for "Electric air circuit breakers."

The air circuit breaker illustrated by Fig. 1 is in a form that is particularly adaptable for central stations and sub-stations wherein the circuit breaker unit can be bodily disconnected and connected with respect to the stationary circuits by a simple plugging operation. That is, in the present instance the circuit breaker is of the well-known drop-down type wherein disconnection is effected merely by bodily lowering of the circuit breaker. In turn the breaker unit is usually housed in a grounded metal enclosure or cubicle (not shown). More specifically, the arrangement comprises a main supporting frame 1 for the movable contact structure which comprises a fixed contact 2 and a relatively movable contact 3 that is pivotally mounted at 4 on one of the circuit breaker studs and is operated by means of a reciprocally movable rod 5. The operating rod 5 is suitably connected to an actuating mechanism 6 carried by the frame 1 that may be, as indicated, of the solenoid type. The contacts 2 and 3 are electrically connected to the lower ends of the conductor studs 7 and 8 respectively which also serve as plug type disconnect contacts for the breaker unit. Accordingly, when the contacts 2 and 3 are connected in a power circuit and are separated, an arc may form across the gap indicated.

For the purpose of interrupting this power arc, an arc extinguishing structure generally indicated at 9 is mounted in the frame 1 so as directly to receive the power arc which is under the influence of the magnetic fields produced by the blowout coils 10 and 11. In the arrangement so far described, the arc extinguishing operation is similar to that in a conventional arc chute wherein the arc is formed at a narrow entrance part of the chute and is rapidly extended in the form of a loop through the chute.

Referring more particularly to Figs. 2 and 4, the arc extinguishing structure comprises spaced side walls 12 and 13 composed of arc resisting material, such as asbestos board, each side wall having on the side facing the other wall a plurality of parallel fins 12' and 13' respectively as best shown by Fig. 4. The fins 12' and 13' are preferably integral with the side walls which are joined and suitably clamped together at the ends 14 and 15. The length and spacing of the fins 12' and 13' are such that when the side walls

12 and 13 are clamped together, the fins are interleaved with respect to each other, i. e. in staggered relation, so as to form a sinuous or zigzag passage 16 into which the arc is driven at the entrance 17 of the chute-like structure 9. As shown by Fig. 2, which illustrates but half the extinguishing structure, namely the side wall 13, the fins extend in a direction transverse to the direction of the movement of the arc as it passes from the entrance 17 into the chute.

As the arc is driven by the magnetic blow-out field into the entrance passage 17 of the arc extinguishing structure, there is comparatively little transverse deflection of the arc stream during this initial movement due to the fact that the fins 12' and 13' are tapered toward the arc entrance at 17. As the arc is driven into the zigzag space defined by the interleaving fins, the cross-section of the arc is reduced as the arc assumes a serpentine form. If the arc is not interrupted at this point, the blow-out field continues to move the arc outward through the arc passage, thereby progressively lengthening the path of the arc as the amplitude of the zigzag path becomes greater. The arc is thereby greatly lengthened and attenuated concurrent with maximum cooling effect due to the large cooling surface of the fins as the arc approaches the exhaust part of the extinguishing structure.

As previously indicated, the switch contacts and the magnetic blow-out structures can assume any preferred form and form no part of the present invention. In the arrangement specifically illustrated, referring to Fig. 2, the magnetic blow-out coils 10 are electrically connected to the conductor stud 7 and to the arc runner 10' so that the arc current traverses the blow-out coils in a manner well-known in the art. Normally the current is carried in the closed circuit position of the breaker by the spring biased contact 2', the current being shunted to the arcing contact 2 upon opening of the breaker. As the arc is drawn by the movable contact 3, it is transferred to the arc runner 11' (Fig. 2) when it passes the position indicated by Fig. 1 so that the blow-out coil 11, which is electrically connected at 18 to the conductor stud 8, is now connected in series with the arc current. Accordingly, the blow-out coils are energized by the arc current to influence the arc in a well-known manner. For the purpose of utilizing the blow-out field to the greatest extent, iron pole pieces 19 are secured along the outer sides of the extinguishing device as illustrated by Fig. 4.

Although the arc extinguishing structure above described is very effective for interrupting both overload and short circuit currents, the arc, along with the ignited gases, may in certain instances be expelled from the exhaust end of the interrupter. Since this is generally objectionable in practice even though the arc may be ultimately extinguished, means are disclosed for suppressing the arc at the chute exhaust and for preliminary cooling of the highly heated arc gases without creating excessive back pressure which would decrease the interrupting capacity of the breaker.

This arc suppressing structure can be incorporated in the side walls 12 and 13 or take the form of a detachable unit 20 illustrated by Fig. 3 wherein a pair of spaced insulating strips 21 and 22 are clamped with respect to insulating end portions 23 and 24 so as to form an elongated rectangular frame in which are alternately mounted spaced insulating and metal plates 25 and 26 respectively. The plates 26 are shown as corrugated and permit free passage of gas from the chute exhaust. As indicated by Fig. 2, the arc suppressing unit of Fig. 3 can readily be secured to the exhaust part of the main extinguishing structure, such as by securing the insulating strips 21 and 22 to the outer sides of the chute as indicated at 27.

The interleaving arc chute with respect to its arc-entrance portion and the arc suppressor unit 20 are more specifically disclosed and are claimed in an application, Serial No. 298,946, filed concurrently herewith by L. J. Linde for "Electric air circuit breaker."

The arc chute so far described would probably in the case of severe overloads or short circuits eject incandescent gases in varying amounts. This obviously cannot be tolerated in an indoor station as attendants might be seriously burned and also damage to other equipment might result in the case of flash-over due to the heated gases within the breaker metal enclosure (not shown). In order more completely to thus house the interrupting device and to guard against injuries and flash-over due to possible ejection of hot gases, an insulating casing 28 is mounted on the frame 1 to enclose the arc chute. The casing 28 is provided at the exhaust end of the chute with a detachable insulating cover member 29 composed of asbestos board for example. This member is parallel and adjacent to the outer grounded metal wall indicated at 1' and is spaced a short distance from the unit 20. The cover also coacts with a wedge-shape insulating deflector member 30 for diverting in stream-line flow the heated arc gases from the chute into opposite sides of the casing 28 as indicated by the flow direction arrows in Fig. 2. As further shown by Fig. 5, a portion of the wedge is formed on the cover 29 at 30' and tapered part 30'' (Figs. 2 and 3) is mounted in the unit 20. When the cover 29 is secured in position at the end of the housing 28 the portion 30' abuts the tapered portion 30'' to form a unitary streamline deflecting member 30 for equally dividing the chute gases. Dowel pins or the like can also be used as indicated to insure correct positioning of the parts. The streamlining of the gas flow by the deflector 30 is further improved by arranging the plates of the exhaust unit 20 substantially parallel to the deflecting surfaces of the wedge. This is clearly shown by Fig. 2 wherein the divided gas stream is indicated as flowing uniformly from the entire exhaust area in opposite diverging directions. The exhaust back-pressure is thereby minimized.

The deflector or wedge member 30 in combination with the insulating cover 29 has a further important function in aiding the circuit breaker effectively to clear the circuit on heavy short circuit currents. Where very close quarters are involved, as in the present case, it is important that the conducting gases be electrically isolated where possible to minimize the danger of flash-over. By way of explanation, let it be assumed that the exhaust end of the chute and the grounded metal wall 1' are separated simply by a closely spaced plane insulating wall.

This wall may effectively prevent flashover to the grounded metallic structure beyond, but it would not preclude the possibility of flashover between the arc runner extremities within the chute and across the exterior of the arc suppressor device at 20. Actually the provision of such a protective insulating cover plate across the chute exhaust without other means increases the hazard of such a flashover or the establishment

of an arc across the inner face of the suppressor, due to the sudden concentration of the hot conducting exhaust gases across the restricted zone between the chute exhaust opening and the cover plate caused by the impedance to gas flow by the cover plate.

In this connection it will be observed that the wedge structure **30**, **30''** has two distinct functions, both of which serve to minimize or prevent this external flashover hazard where a protective cover plate is used. In the first place the divergent surfaces of the wedge-like member serve to deflect the hot gas blast (which is of higher pressure in the central part of the chute) so that it impinges obliquely and divergently against the cover plate and is thereby rapidly dissipated in opposite directions. This minimizes the gas concentration which would occur without these deflecting and guiding surfaces. The obliquely positioned plates **25** and **26** within the arc suppressor unit **20** also assist in this divergent pressure dissipating action by extending the deflection along the entire length of the chute exhaust.

Secondly, the wedge member, in extending from within the arc interrupting chute, through the arc suppressor structure to the insulating cover plate serves as an electrically isolating barrier between these deflected bodies of divergently flowing hot conducting gases. In other words, the two bodies of gases so deflected in opposite directions are now in a practical sense insulated with respect to each other.

Tests on this type of circuit interrupter, in which a transverse division baffle extending from within the chute to the cover plate was used, and in which the arc suppressor plates were disposed perpendicular to the cover, have indicated that the single use of either of the functions above described materially aids in preventing failures when interrupting heavy currents. By combining these functions in the preferred wedge design, I reduce the danger of flashover failures to a minimum.

It will be observed, referring to Figure 2, that the wedge tip portion **30''** extends within the chute and is substantially continuous with the fin structure of the arc chute. Therefore, even though large quantities of arc gases are vented at opposite sides of the chute exhaust, flashover cannot take place except around the tip of the wedge within the chute, and this is unlikely due to the restricted arc path and the fact that the length of the possible path of arcing has been appreciably increased. Furthermore, most of the arc gases by this time have been driven from the chute proper. In the case of heavy current interruptions the arc itself may extend to the very exhaust of the chute and impinge on the insulating tip **30''**. In such a case, the wedge or barrier structure also functions to divide or cut the arc to facilitate extinction thereof.

For the purpose of further deflecting and dissipating the arc gases to the maximum extent consistent with the size of casing **28**, the cover **29** is provided with additional insulating deflectors **31**, as best illustrated by Figs. 5 and 6, so as further to divide the gas flow from each half of the chute substantially equally and to deflect and reverse the direction of the divided streams of gas backward as indicated by Fig. 6 along the outer walls **21** and **22** of the extinguishing device or chute. There will be division and backward deflection of chute exhaust gases as indicated by the flow-direction arrows in Fig. 6 due to the high velocity of these gases. The gas as so cooled and deflected along all four outer walls of the corresponding chute **9** can now flow harmlessly through the grills **32** at opposite sides of the casing **28** as shown by Figs. 2 and 6. Also slots **32'** for this purpose are formed in the bottom wall of the casing **28**.

Further to provide ample electrical clearance with respect to the grounded metal wall at **1'** adjacent to the cover **29**, the arc gases are further deflected as they flow from the casing **28**. As shown by Fig. 2 the grills or louvres **32** are disposed parallel to the wedge deflector **30** and are inclined toward the rear of the chute at an angle of approximately 45°. A strip of insulation **35**, triangular in cross section, is secured to each adjacent edge of the cover **29** (Figs. 2 and 5) for coacting with the grills to insure backward deflection of all gas flowing through the upper and lower grills. Thus, the streamlining of the gas flow, beginning with the wedge **30**, is effected throughout reversal without excessive turbulence and back pressure. The resulting free and unimpeded circulation of air aids arc interruption by minimizing exhaust resistance.

It will be noted also that the separated bodies of gases flowing from the top and bottom of casing **28** are completely reversed in direction and are appreciably spaced and insulated from each other, thereby further minimizing any chance of flash-over.

The cooling of the chute itself by the circulation of fresh air therethrough is also enhanced by the above described arrangement. That is, the arc in moving through the chute like a piston drives ahead of it diverging currents of air along the opposite outer walls of the chute which in turn cause flow of air from opposite directions into the entrance of the chute.

Although a single-phase circuit breaker and arc chute is indicated by Figs. 1 and 2 in the interest of clearness, it shall be understood that my invention is readily applicable to polyphase circuit breakers as shown by Figs. 5 and 6. In Fig. 6 a single arc extinguishing unit **9** of a three-phase breaker is shown, the other two units being located at opposite sides thereof and separated therefrom by insulating partitions **33**, said partitions being shown in full-line section at the opposite sides of the interrupting unit **9**. The phases are thereby completely segregated since the outer edges of the partitions fit within slots **34** formed in the deflecting ridges **31** of the cover **29**.

It will therefore be noted, referring to Figs. 2 and 6, that arc gases flowing from each chute **9** are divided four ways so as to flow along a comparatively large cooling surface formed by the outer walls of the chute structure, the insulating partitions **33**, the deflecting surfaces of the cover **29** and also the inner walls of the enclosing casing **28**. This large cooling surface is provided without impairing to any material extent the arc interrupting capacity of the breaker. Also compactness, an essential requirement for indoor breakers, is retained since it will be noted that the size of the breaker is but slightly increased by the enclosing casing **28**.

Although I have illustrated and described in detail a preferred commercial form of my invention, it should be clearly understood that my invention may assume various forms. In the modification shown by Figs. 7 and 8, the arc chute **9** insofar as the interior fin structure is concerned is generally similar to that of Fig. 2. The in-

sulating wall or cover 29 is also disposed opposite and closely adjacent to the chute exhaust as illustrated. Extending from the wall 29 to a point within the chute is an insulating barrier 40 comprising in the present instance a plate-like member composed of horn fibre or the like. As shown by Fig. 8, the barrier 40 extends from the wall 29 into the chute entirely across the enclosing housing so as not only to divide the gases above the chute but also those at opposite sides of the chute for a limited distance. This arrangement tends to prevent flashover in the region adjacent to the chute exhaust. Fillets may be provided for deflecting purposes as indicated at 40' between the barrier 40 and the wall 29.

In the present instance, the plates 25 and 26 of the arc suppressing device 20 are disposed substantially perpendicular to the wall 29, i. e. parallel to the adjacent sides of the barrier 40 so that they do not function as gas diverting means. However, the wall 29 may be provided with deflecting surfaces 31 similar to the deflectors shown in Fig. 5 for diverting the gases in opposite directions along the longitudinal axis of the chute exhaust as clearly shown by Fig. 8. This prevents local concentration of the arc gases in the space between the chute exhaust and the wall 29. It will thus be seen that the two main bodies of gases separated by the barrier 40 are substantially insulated with respect to each other so that flashover through these gases is unlikely.

In Fig. 9, the structure is considerably simplified without, however, losing the advantages of protection through gas diversion. As previously pointed out, the divergence or separation by dispersion of bodies of hot gases serves to lessen the probability of flashover along a path through the separated bodies of gases. In this modification, although there is no insulating barrier extending beyond the chute exhaust, the diverting function of the insulating wedge 50 in combination with the correspondingly inclined plates 25 and 26, which follow the arrangement of Fig. 2, is sufficient to cause such diversion and separation of the exhaust gases beyond the chute exhaust that the performance of the breaker is greatly improved as compared with the case where there is no diverting means at the chute exhaust. This is due to the fact that the exhaust gases at one side of the wedge are deflected obliquely against the cover plate 29 from where they are deflected toward the venting louvres 32, and the gases at the opposite side are similarly and oppositely deflected and vented.

Another modification of my invention for combining the dividing and diverting methods above described is shown by Fig. 10. Here the chute 9 is provided with arc interrupting fins 50 that extend parallel from the chute entrance portion 17 to approximately the mid-section of the chute in the same manner as the fins 13' of Fig. 2. From that point, the fins such as the group 50' on one half of the chute wall follow concentric arcs toward the adjacent lateral side of the chute at 51, and the fins in the other group at 50'' on the other half of the chute wall also follow concentric arcs toward the opposite lateral side of the chute at 52.

It will thus be noted that the design is symmetrical with respect to the central transverse axis of the chute. The top of the chute at 53 is closed so that the chute gases are substantially equally divided by the diverging groups of fins 50' and 50'', and then diverted in opposite directions through the lateral exhaust openings of the chute at 51 and 52 respectively. The outer edges of the fins 50' and 50'' are spaced from the cover 53 so as to form a lateral passage 53' leading to both exhaust openings 51 and 52 for venting gases from the central part of the chute.

The complementary side of the chute is not shown, it of course being understood that the design is similar except for the offset in the position of the fins so that the fins of both sides interleave as in the case of Fig. 4. Also the chute exhaust openings at 51 and 52 are provided with spaced arc suppressing plates 25 and 26 which may conveniently be in the form of separate units as in the case of Fig. 2.

In this design, the separated bodies of gases are spaced by the entire width of the arc chute so that the only opportunity for flashover is through the chute itself. Since this is quite unlikely due to the restricted passages which tend to cause immediate extinction of arcing, it will be apparent that this form of my invention has certain inherent advantages as to flashover. In addition, the chute itself has high interrupting capacity so that this feature is not weakened for other considerations.

The insulating enclosing housing for the arc chute illustrated by Fig. 10 can be of the same form as that shown by Fig. 2. In the case of Fig. 10, however, the ventilating louvers of the insulating housing would preferably be positioned somewhat removed, i. e. offset, from the chute exhaust openings 51 and 52.

It should be understood that my invention is not limited to specific details of construction and arrangement thereof herein illustrated, and that changes and modifications may occur to one skilled in the art without departing from the spirit of my invention.

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

1. An air circuit breaker comprising an arc chute having an exhaust opening for venting arc gases, means for substantially equally dividing and deflecting said vented gases to flow in oppositely directed streams exteriorly of said chute, and means for further sub-dividing and deflecting each of said equally divided streams backward along opposite sides of said chute so that all gases from said chute are deflected and dissipated in at least four directions exteriorly of said chute.

2. An air circuit breaker comprising an arc chute having an elongated rectangular exhaust opening for venting arc gases, a dividing and deflecting member disposed substantially at the midpoint of said opening and across the width thereof for dividing and deflecting said vented gases to flow in opposite directions substantially parallel to the length of said opening, and additional dividing and deflecting structure disposed at opposite sides of said first deflector and adjacent said opening for further subdividing and deflecting the aforesaid oppositely directed gases so as to flow in opposite directions substantially transversely of the length of said opening whereby gas from said chute is deflected, cooled and dissipated in reverse flow along the four exterior walls of said chute.

3. A polyphase air circuit breaker comprising an insulating housing, a plurality of single phase circuit breakers including individual arc chutes mounted in spaced relation in said housing, said housing being in closely spaced relation to said arc chutes, insulating partitions within said housing between said arc chutes, means for dividing and deflecting gas vented from each of said chutes

in opposite directions toward oppositely disposed walls of said housing respectively, and means for further subdividing and deflecting said gas so divided in opposite directions toward the other oppositely disposed walls of said housing, said gas thereby being caused to flow backward along a large cooling surface defined by the outer side walls of said chute, and the enclosing housing and insulating partition walls.

4. An air circuit breaker comprising an insulating arc chute, an insulating housing in closely spaced relation to said chute, the exhaust opening of said chute facing in close proximity an insulating cover for said housing, said insulating cover having gas dividing and deflecting ridges for dividing, sub-dividing and deflecting gas vented from said chute to flow backward within said housing along the exterior walls of said chute to be cooled and dissipated.

5. A polyphase air circuit breaker comprising an insulating housing, a plurality of single phase circuit breakers having individual arc chutes mounted within said casing, each of said arc chutes being arranged to vent arc gases toward an end of said housing, an insulating cover for that end of said housing closely spaced from the respective chute exhaust openings, a deflecting member on said cover extending transversely of said exhaust openings for deflecting exhaust gases from each chute toward opposite walls of said housing, said cover having additional deflecting means for subdividing and deflecting said gas in opposite directions substantially transversely of the direction of the first deflection whereby gas from said arc chutes is deflected backward from said cover toward the top, bottom and side walls of said housing and is thereby cooled before being vented from said housing.

6. An air circuit breaker comprising an arc chute having an exhaust opening for venting arc gases, a housing including a cover member spaced from and facing said exhaust opening, and gas dividing and deflecting structure for directing said gases in opposite directions from said chute, said structure including a wedge shaped member formed in two cooperating parts, one of which is mounted on said chute at said exhaust opening and the other mounted on said cover member.

7. An air circuit breaker comprising an arc chute having an exhaust opening for venting arc gases, gas dividing and deflecting structure for directing said gases in streamline flow in opposite directions from said chute, said structure including a wedge-shaped member disposed centrally of said exhaust opening, and a plurality of cooling plates also disposed in said exhaust opening at opposite sides of said wedge member, the plates at each side of said member being disposed edgewise to gas flow from said chute and inclined in diverging directions substantially parallel with the adjoining deflecting surface of said wedge member whereby said arc gases are divided and deflected uniformly from the exhaust of said chute.

8. An air circuit breaker comprising an arc chute having an exhaust opening for venting arc gases, a housing including a detachable cover member spaced from and facing said exhaust opening, and gas dividing and deflecting structure cooperating with said cover member for directing said gases in streamline flow in opposite directions from said chute, said structure including a wedge shape member mounted centrally of said exhaust opening, and a plurality of cooling plates also disposed in said exhaust opening at opposite sides of said wedge member, said plates forming therebetween gas passages extending in diverging directions at opposite sides of said wedge member whereby the divided gas flow is substantially uniformly in the same diverging direction in each half of the exhaust opening.

9. An air circuit breaker comprising an arc chute having an exhaust opening for venting arc gases, a housing including an insulating cover member spaced from and facing said exhaust opening, and gas dividing and deflecting structure for directing said gases in streamline flow in opposite directions from said chute, said structure including a wedge shape member disposed centrally of the exhaust opening of said chute, means also disposed in said exhaust opening for directing uniformly in the same direction the divided gas flow at each side of said wedge member, said insulating cover being arranged further to deflect said gas toward the opposite ends of said chute, and venting means in the opposite side walls of said housing for deflecting backward away from said cover the divided gas flow whereby a substantial reversal in direction of gas flow from said chute is effected.

10. A metal enclosed air circuit breaker comprising an arc chute having an exhaust opening for venting arc gases, means disposed at said exhaust opening for substantially equally dividing and uniformly deflecting in diverging directions said arc gases, a housing enclosing said chute and having an insulating front wall disposed between said exhaust opening and a grounded metal wall of the enclosure, said insulating wall serving further to deflect said divided gas flow laterally towards opposite side walls of said housing, and venting and deflecting means disposed in said side walls for directing backward away from said metal wall said divided gas flow so that substantial reversal in direction of gas flow from said chute is effected, the aforesaid dividing and deflecting means effecting the changes in direction of gas flow with minimum turbulence whereby the back pressure at said exhaust opening is minimized.

11. An air circuit breaker comprising an arc chute having an arc entrance portion and a gas exhaust portion, relatively movable contacts separable to form the interrupting arc at said entrance portion, means for driving said arc into said chute for extinguishing it, an insulating cover wall facing and closely spaced with respect to the exhaust portion of said chute, and an insulating barrier at the chute exhaust substantially continuous with and extending at right angles to said insulating cover wall for dividing the arc gases flowing from said exhaust portion and for electrically isolating the divided gas bodies with respect to each other, said divided bodies of gas being guided by said insulating cover in opposite directions away from said exhaust whereby voltage flashover at said chute exhaust through the exhaust gases is substantially minimized.

12. An air circuit breaker comprising an arc chute having an arc entrance portion, and an exhaust portion, relatively movable contacts separable at said entrance portion, means for dividing and diverting in opposite directions the arc gases from said exhaust portion comprising an insulating wall facing and closely spaced with respect to the exhaust of said chute, and an insulating barrier extending from said wall into said chute exhaust so as to constitute a substantially continuous part of said chute, said insulating barrier having its dividing edge disposed

transversely of the length of the arc entirely across the chute exhaust so as electrically to isolate the diverted bodies of arc gases that have been deflected in opposite directions by said insulating barrier and wall.

13. An air circuit breaker comprising an arc chute having an arc entrance portion and an exhaust portion, relatively movable contacts separable at said entrance portion, an insulating housing for said chute, one side of said housing constituting an insulating wall facing and closely spaced with respect to the exhaust of said chute, and gas dividing means forming an insulating barrier substantially continuous with said insulating wall and extending into said chute exhaust for dividing the chute gases into separate bodies at opposite sides of said barrier whereby said bodies of gases are substantially insulated with respect to each other and flashover at said chute exhaust within said insulating housing is minimized.

14. An air circuit breaker comprising an arc chute having an arc entrance portion and an exhaust portion, relatively movable contacts separable at said entrance portion, means constituting an insulating wall facing and closely spaced with respect to the exhaust of said chute, and insulating structure forming a substantially continuous barrier from said insulating wall to a point within said chute for dividing the arc gases from said chute into separate bodies at opposite sides of said barrier for insulating said bodies with respect to each other, the extremity of said barrier within said chute serving to divide and assist interruption of the arc in the case of heavy current interruptions.

15. An air circuit breaker comprising an arc chute having an arc entrance portion and an exhaust portion, relatively movable contacts separable at said entrance portion, means for diverting in opposite directions the arc gases from said exhaust portion including an insulating wall facing and closely spaced with respect to the exhaust of said chute, an insulating barrier disposed substantially centrally of said chute exhaust and extending into said chute, said insulating barrier having its dividing edge disposed transversely of the length of the arc entirely across the chute exhaust so as to divide an arc approaching said chute exhaust, the extremity of said insulating barrier extending within said chute being of wedge shape form to divert arc gases from said chute in opposite directions along said insulating wall, and gas deflecting means in said chute at opposite sides of said wedge shape barrier for diverting in the corresponding direction the gases from the entire exhaust portion.

16. An air circuit breaker comprising an arc chute having an arc entrance portion and exhaust openings for venting arc gases from said chute, relatively movable contacts separable at said entrance portion, an insulating housing for said chute including wall structure disposed opposite and closely adjacent to said exhaust openings, and means for diverting the flow of arc gases from said chute and exhaust openings in widely divergent directions for causing substantial dispersion and separation of bodies of hot exhaust gases within said housing thereby minimizing the danger of flashover within said housing.

17. An air circuit breaker comprising an arc chute having an arc entrance portion at one end thereof, relatively movable contacts separable at said entrance portion, an exhaust opening on each side of said chute positioned laterally with respect to said entrance portion, arc extinguishing baffle structure in said chute extending from said entrance portion toward said exhaust openings so as to divide the chute gases and divert them through said exhaust openings respectively at opposite sides of said chute, and arc suppressing means disposed in said lateral exhaust openings for confining arcing to the interior of said chute.

18. An air circuit breaker comprising an arc chute having an arc entrance portion at one end thereof, relatively movable contacts separable at said entrance portion, an exhaust opening on each side of said chute positioned laterally with respect to said entrance portion so that both extremities of the arc, as contrasted with the central portion of the arc, move toward said exhaust openings respectively, the side of said chute opposite to said entrance portion being closed, arc extinguishing baffle structure extending toward said exhaust openings respectively and disposed substantially symmetrically with respect thereto, the baffle structure on one side causing flow of chute gases toward one of said exhaust openings, and the baffle structure at the opposite side causing flow of chute gases toward the oppositely disposed exhaust opening whereby the chute gases are diverted at opposite sides of said chute, and arc suppressing means disposed at said exhaust openings for confining arcing to the interior of said chute.

19. An air circuit breaker comprising an arc chute having an arc entrance portion at one end thereof, relatively movable contacts separable at said entrance portion, an exhaust opening on each side of said chute positioned laterally with respect to said entrance portion, and arc extinguishing baffle structure in said chute extending from said entrance portion toward said exhaust openings in closely confining relation to the arc so as to divide the chute gases and divert them through said exhaust openings respectively at opposite sides of said chute.

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