Nov. 27, 1934. S. RUPPEL 1,982,355

GAS BLAST SWITCH

Original Filed July 29, 1929

Fig. 1.

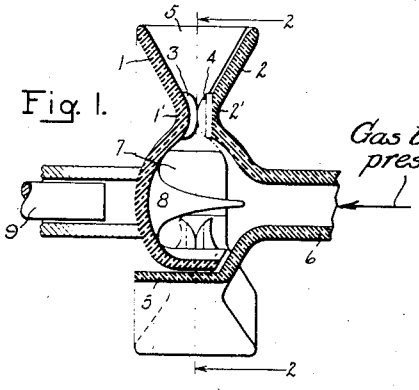


Fig. 2.

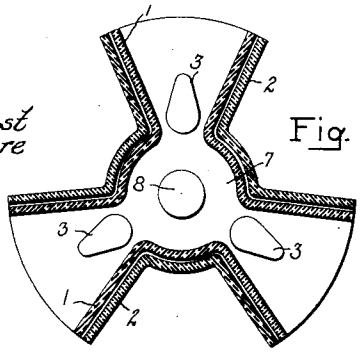


Fig. 4.

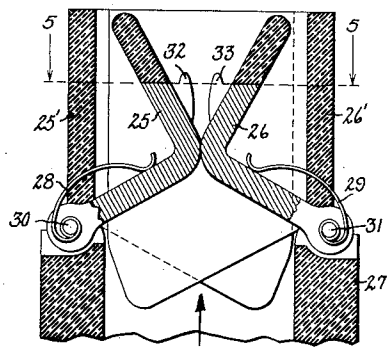


Fig. 3.

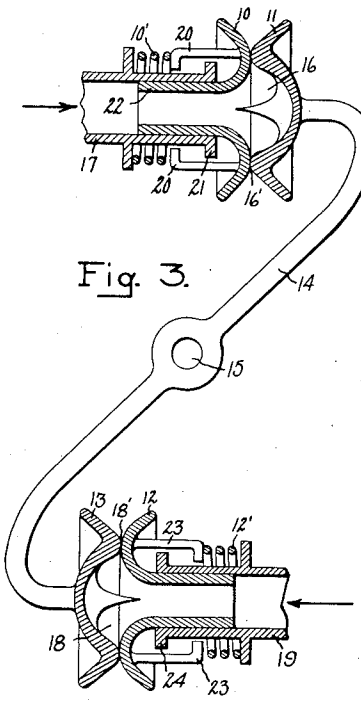


Fig. 6.

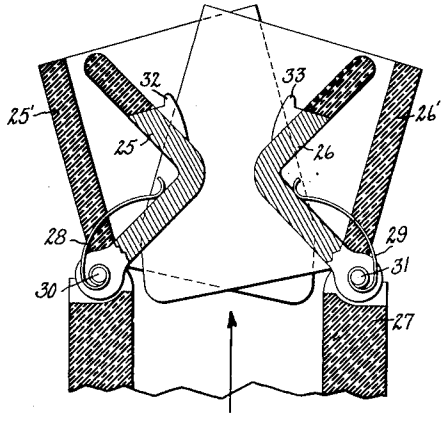
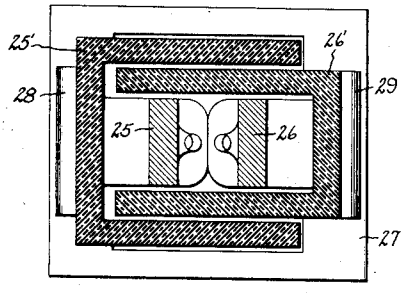


Fig. 5.



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1,982,355

UNITED STATES PATENT OFFICE

1,982,355

GAS BLAST SWITCH

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Original application July 29, 1929, Serial No. 381,945, now Patent No. 1,947,230, dated February 13, 1934. Divided and this application September 23, 1933, Serial No. 690,682. In Germany August 6, 1928

12 Claims. (Cl. 200—148)

My invention relates to electric switches of the gas-blast type wherein an arc formed upon separation of the switch contacts is extinguished by a blast of gas directed across the arc gap, and has for its principal object the provision of an improved switch of the gas-blast type.

This application is a division of my copending application Serial No. 381,945, filed July 29, 1929, for Electric circuit breaker, now Patent 1,947,230, issued February 13, 1934.

My invention will be more fully set forth in the following description referring to the accompanying drawing 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 drawing, Fig. 1 is a fragmentary view, partly in section, of switch contact structure embodying one form of my invention; Fig. 2 is a view taken along the section line 2—2 of Fig. 1; Fig. 3 is a view, partly in section, of a double break switch illustrating another form of my invention; Fig. 4 is an elevational view, partly in section, of a modified form of my invention; Fig. 5 is a plan view in section of the structure shown along line 5—5 of Fig. 4, and Fig. 6 is a view similar to Fig. 4 showing the switch in the open circuit position.

A gas blast arrangement for interrupting arcs formed upon opening of a circuit is shown in Figs. 1 and 2 and comprises a multiple series break, each break being simultaneously subjected to a radial gas blast. The switch contacts of a single break are arranged to separate within a diverging or nozzle-like exhaust passage, the passage varying in size and shape during the gas blast therethrough so that at some particular moment the arc is subjected to conditions most favorable to interruption thereof.

More specifically, the arrangement in Figs. 1 and 2 comprises a pair of disc-like members 1 and 2 having complementary configurations and coacting in a manner hereinafter described to form both the switch casing and relatively movable contact structure. In the present case the disc-like members 1 and 2 have formed therein bulged portions 1' and 2', respectively, arranged so that when the members are superimposed and in contact, the bulged portion of one disc and the corresponding portion of the other disc form a nozzle-shaped chamber between the same. This is clearly shown in Fig. 1, the throat portion of each nozzle-shaped chamber being closed when the circuit is complete.

The coacting contacts 3 and 4 of each set are arranged in pairs and are mounted on the discs 1 and 2, respectively, adjacent the restricted part of the corresponding nozzle-shaped chamber. The contacts upon separation thereof are accordingly in the path of a high velocity blast when gas is directed from said chamber to exhaust through said restricted part.

For the purpose of guiding the gas blast through each nozzle-like chamber so that the blast may be more effectively directed across the corresponding pair of contacts during the separation thereof, the outer portions of the discs may be arched to form side walls 5 of such dimensions that the coacting walls overlap in the closed position of the switch. It will, therefore, be seen that during the initial switch opening movement when the disc members are moved laterally away from each other the coacting wall members still confine flow of gas within the nozzle-like chambers.

The blast for extinguishing arcing is supplied from any suitable source of pressure as indicated by the pipe 6 which is in communication with the central chamber 7 formed by the members 1 and 2. The gas under pressure is deflected, as by a cone-shaped member 8 mounted on the disc 1, and flows radially towards the periphery of each disc where it is divided into three jets exhausting through the respective nozzle-shaped chambers and across the arcs formed between the contacts at the throat passages.

For the purpose of effecting opening of the switch, the disc member 1 may be guided for lateral movement, as by a guide rod 9, so that the force of the blast entering the central chamber 7 causes separation of the disc members 1 and 2. It will be apparent that the member 1 may be suitably biased, as by a spring (not shown), into engagement with the coacting member 2.

During opening of the switch the blast from the central chamber 7 is directed across each pair of contacts 3 and 4 immediately upon separation thereof in a most effective manner since the contacts are located adjacent the restricted or throat portion of the chamber where the arc-rupturing action of the blast is most effective. Although the nozzle-shaped chambers confine the gas blast only during initial separation of the contacts, the blast during this period is generally sufficient to interrupt arcing.

The coacting pairs of contacts 3 and 4 may be formed of any suitable material, as copper or tungsten for example, and are preferably stream lined in shape as illustrated by Fig. 2 so that minimum resistance is offered to the flow of gas through the nozzle-like passages. They may also be constructed so that they conform almost completely to the outline of the switch casing. Auxiliary arcing contacts of material resistant to vaporization may also be provided if desired.

It will also be apparent that each disc may be provided with radial ribs forming the wall structure of the nozzle-like passages. The disc members may be covered with insulation, as ceramic

material, or they may be constructed wholly or partially of such material.

Fig. 2 shows more clearly a triple break arrangement, it being obvious that the breaks may be either in series or in parallel, or if desired, as single breaks in a three-phase circuit. Flexible conductors (not shown) may be used in a well-known manner to connect the respective contacts in the circuit, or circuits, to be controlled as desired.

The operation of certain types of switches, as disconnect switches in high tension transmission systems for example, may involve the interruption of a high tension, low current arc in air. In such switches the arc is generally rapidly lengthened in air along horn gaps or the like until the arc finally breaks. However, the arc may persist requiring several reclosures and openings before the arc breaks. The application of the gas blast principle to this type of switch is particularly advantageous since a low current arc is readily disrupted and extinguished by the gas blast.

Fig. 3 discloses a disconnect switch embodying the principles disclosed by Figs. 1 and 2. In this arrangement there are two breaks in series, one break formed by a pair of coacting disc members 10 and 11 generally of the character above described and the other break by a similar pair of members 12 and 13. An annular passage, nozzle-shaped in cross section is formed by the complementary configurations of the disc member of each pair when the same are separated.

The members 11 and 13 are mounted upon and interconnected by a conducting bridging arm 14 pivotally mounted as at 15 so that rotation of the arm 14 causes engagement and disengagement of the coacting pairs of disc members. The arrangement, however, may be such that the series breaks are disposed in a straight line, as where lateral movement of the interconnecting arm causes engagement and disengagement of the switch contacts.

As in the previous instance, the gas blast is directed from a source of pressure indicated by the arrows to a central chamber formed by each pair of disc members. The central chamber 16 formed by the discs 10 and 11 is in communication with the gas supply pipe 17 and the chamber 18 is similarly in communication with a supply pipe 19. It will be apparent that the supply pipes 17 and 19 may branch from a single line so as to be controlled by one valve, opening of which admits gas under pressure simultaneously to the chambers 16 and 18 causing immediate clockwise rotation of the arm 14 and separation of the coacting disc members.

At the instant of separation of the disc members 10 and 11 for example, the gas blast from the central chamber 16 issues radially towards the periphery of the discs and through an annular nozzle-like passage formed between the discs. Since the arc is initially drawn at the contacting or throat portion 16' of this annular passage, the gas blast is particularly effective to interrupt the arc during initial separation of the discs.

In order to insure high speed of separation of the disc contacts, the disadvantages of overcoming friction or inertia during initial separation are overcome by moving the pairs of contacts together as a unit for a certain distance until considerable momentum of the moving parts has been acquired. To this end the pairs of discs remain in following engagement under the influence of suitable biasing means, as springs 10' and 12' respectively after which separation is caused by limit means. The limit means for members 10 and 11 comprises a pair of lugs 20 mounted on the discs 10, arranged to engage a collar 21 secured to the pipe 17. The disc 10 is provided with an extension 22 forming a telescopic connection with the pipe 17. In a similar manner the disc 12 is provided with lugs 23 arranged to engage the collar 24 when the disc 12 reaches its limit of movement under bias of spring 12'.

The operation of the disconnect switch above described is believed to be apparent and may be summarized as follows: With the switch closed admission of the gas blast to the central chambers 16 and 18 causes repulsion of the discs 11 and 13 tending to rotate the arm 14 in clockwise direction. The coacting contact discs 10 and 12, however, remain in following engagement with the discs 11 and 13 respectively for a certain distance beyond which immediate and high speed separation of the contact structure occurs. The instantaneous radial blast across the arc is effective to extinguish the same. It will, therefore, be noted that high speed separation of the contacts is always concurrent with an effective gas blast. The switch closing operation may be effected in a suitable manner, as by the release of means retaining the switch open.

The arrangement shown in Figs. 4, 5 and 6 comprises another arrangement wherein the contacts themselves form a nozzle-like interrupting passage. The switch contacts 25 and 26 are mounted within an insulating casing 27 forming a passage for the gas blast. In the position shown the contacts 25 and 26, which are shaped to form a nozzle-like passage between the same, are normally biased, as by springs 28 and 29, into contact thereby closing the gas passage within the switch casing. The switch contacts 25 and 26 may, however, be biased together by springs or the like which are released in response to certain applied pressure tending to open the contacts. Opening of the contacts is effected by direction of the gas blast through casing 27 in the direction indicated, the pressure causing opposite rotation of the contacts about the respective pivotal supports 30 and 31 and formation of a nozzle-like passage between the contacts. The side walls of the gas passage are formed by complementary telescopic insulating members 25' and 26' which are co-pivotally mounted on casing 27 with contacts 25 and 26 respectively so as to be movable therewith as best illustrated by Fig. 6.

The arc which is first drawn at the point of separation, that is at the throat of the passage, is subjected to the direct action of the gas blast tending to blast the arc through the diverging exhaust portion of the passage. For the purpose of aiding interruption of the arc, the contacts 25 and 26 may be provided with auxiliary arcing portions 32 and 33 which are composed of metal resistant to vaporization, as tungsten for example. The arc is then finally broken at the tips of the arcing portions. The switch may be closed in any suitable manner, as by releasing the contacts and permitting springs 28 and 29 to bias the same into engagement, the specific means holding the contacts open forming no part of the present invention.

As in the previous instances, the shape of the nozzle-like passage through which the gas blast is directed varies during contact separation so

that the arc at some particular moment is subjected to the most effective interrupting action of the blast thereby resulting in rapid interruption of the arc.

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. A circuit interrupter of the gas-blast type comprising relatively movable contact structure, said contact structure having complementary configurations forming therebetween a nozzle-like gas passage including a restricted portion during separation thereof, and means for directing gas at high velocity to said contact structure for causing separation of the same at said restricted portion, said gas exhausting between said structure and through said nozzle-like passage.

2. A circuit interrupter of the gas-blast type comprising relatively movable contact structure, said contact structure having complementary configurations forming therebetween a nozzle-like gas passage including a restricted portion when said contact structure is separated, said contact structure arranged to engage at the points defined by the restricted portion of said passage, and means for directing gas under pressure to said contact structure, said gas exhausting between said contact structure and through said nozzle-like passage.

3. A circuit interrupter of the gas-blast type comprising relatively movable contact structure including means having complementary configurations forming therebetween a chamber and a nozzle-like gas passage in communication therewith, and means for directing gas under pressure to said chamber for causing separation of said contact structure, said gas exhausting between said contact structure and through said nozzle-like passage.

4. A circuit interrupter of the gas-blast type comprising a pair of relatively movable disc-like contact members, said contact members having complementary configurations forming therebetween a central chamber, and means for directing gas under pressure to said chamber for causing separation of said contact members, said gas exhausting radially between said contacts from said chamber.

5. A circuit interrupter of the gas-blast type comprising a pair of relatively movable disc-like members having complementary configurations forming therebetween a gas chamber and a plurality of radially disposed nozzle-like gas passages communicating with said chamber, coacting contacts carried by said members respectively at the restricted portions of said passages, and means for directing gas under pressure to said chamber for causing separation of said members, said gas exhausting between said contacts and through said radially disposed passages.

6. A circuit interrupter of the gas-blast type comprising relatively movable disc-like contacts, said contacts having complementary configurations forming therebetween a central chamber and a diverging gas passage at the peripheries thereof during separation of the contacts, and means for directing gas under pressure to said chamber, said gas exhausting between said contacts and radially through said diverging passage.

7. A circuit interrupter of the gas-blast type comprising a pair of relatively movable contacts, said contacts having complementary configurations adapted to form a central chamber and an annular diverging passage communicating therewith, and means for directing gas under pressure to said chamber causing separation of said contacts, said gas exhausting radially between said contacts through said annular diverting passage.

8. A circuit interrupter of the gas-blast type comprising a pair of relatively movable contacts, said contacts having complementary configurations adapted to form therebetween a gas passage having a restricted portion, means for directing gas under pressure through said passage causing separation of said contacts, said gas exhausting from said passage between said contacts to extinguish arcing at said restricted portion, a second pair of similarly constructed contacts, and a bridging member interconnecting a movable contact of each of said pairs of contacts, said bridging member being centrally pivoted and arranged with respect to said pairs of contacts so that the gas pressure at each pair of contacts tends to rotate said bridging member causing opening movement of the movable contacts.

9. A circuit interrupter of the gas-blast type comprising a pair of relatively movable contacts, said contacts in the closed circuit position forming therebetween a chamber adapted to receive gas from the source of pressure, admission of gas under pressure to said chamber causing separation of said contacts, and means biasing said contacts into limited following engagement during the initial movement thereof, separation of said contacts being accompanied by a blast of gas from said chamber exhausting between said contacts.

10. A circuit interrupter of the gas-blast type comprising a pair of relatively movable contacts, said contacts having complementary configurations forming a chamber therebetween in the closed circuit position, said chamber adapted to receive gas from the source of pressure, and means resiliently biasing said contacts into limited following engagement for effecting high speed separation during the circuit opening movement, admission of gas under pressure to said chamber tending to force apart said contacts so that separation thereof is concurrent with an arc extinguishing blast of gas from said chamber to exhaust between the contacts.

11. A circuit interrupter of the gas-blast type comprising a casing forming a gas passage therein, and a pair of opposed contacts pivotally mounted on said casing over the exhaust of said gas passage, admission of gas under pressure to said passage causing an arc extinguishing blast between said contacts, said contacts being shaped so as to form a nozzle-like exhaust passage therebetween during separation thereof.

12. A circuit interrupter of the gas-blast type comprising a pair of relatively movable contacts, means pivotally mounting each of said contacts, means resiliently biasing said contacts together, said contacts being shaped so that a diverging gas passage is formed between the same upon separation thereof, and means forming a gas passage across the exhaust of which said contacts are positioned, admission of gas under pressure to said passage causing blowing apart of said contacts and exhaust of an arc extinguishing blast through the diverging passage formed therebetween.

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