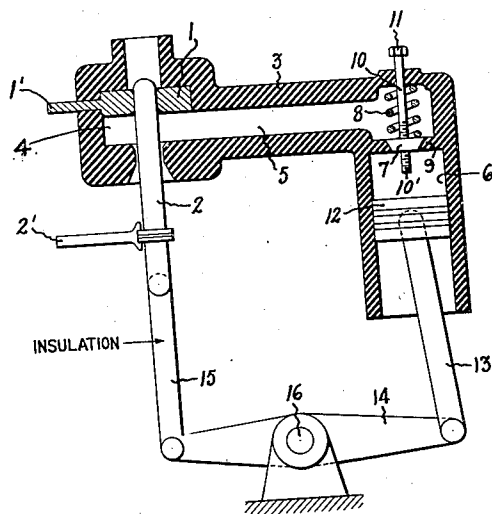


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ELECTRIC CIRCUIT BREAKER
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ELECTRIC CIRCUIT BREAKER

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My invention relates to electric circuit breakers, more particularly to those of the pressure gas or blast type wherein a high velocity jet of gas is directed between contacts upon separation thereof for extinguishing arcing.

In prior types of pressure gas switches, the pressure gas required for extinguishing arcing was provided either by a high pressure storage tank supplied by a motor-operated compressor or the like, or by an automatic compressor or piston incorporated in the switch and operated therewith only during the circuit interrupting process. In the latter case an important limitation is imposed on pressure gas switches, since in the case of high interrupting capacity comparatively large forces are required for the instantaneous compression of gas to the pressure required. In such cases the comparatively large quantities of gas and the high gas pressures involved could not be controlled with the customary arrangements in the case of high tension switches.

The interrupting capacity of a pressure gas switch in which an automatic compression device is incorporated is generally limited by the work of compression which can be produced by a simple manual drive, or by a manually operated power accumulator drive. However, the maximum interrupting capacity of a pressure gas switch of the automatic compression type should be maintained as high as possible and it is, therefore, essential that in switches of this type greater precautions be taken that the compressed gas produced is not rendered less effective through unnecessary leakage, and that the total gas be available for effecting the arc extinguishing operation.

In one well known type of pressure gas switch the point of circuit interruption is generally at a hollow contact, one end of which is open to atmosphere and the other end normally closed by the coating movable contact. This arrangement for closing the gas passage through the hollow contact is very unsatisfactory from a manufacturing point of view, since in the case of the type of pressure gas switches in question a considerable part of the pressure gas automatically produced by the switch is lost. The use of resilient packings for sealing the contacts is usually not possible for technical reasons, an example being variation in the form of the movable contact as a result of burning and of wear during operation. After a short period of time this factor would result in an increase of gas leakage and therefore decrease of the switch interrupting capacity.

The principal object of the present invention is the provision of an improved pressure gas switch having an automatic compression device for directing a blast of gas to the switch contacts only at the instant when the gas blast is necessary or most desirable for extinguishing the arc, as contrasted for example with the prior method of directing the pressure gas to the point of circuit interruption before separation of the contacts. In accordance with my invention, all gas leakage losses are avoided at the contacts during a period generally lasting ten to thirty times the time of arc duration, which may be considered ample time for interrupting the arc.

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, the single figure thereof represents an elevational view, partly in section, of a pressure gas switch embodying my invention.

The pressure gas switch illustrated, by way of example, comprises relatively movable contacts including a stationary hollow contact 1 and a coating movable rod contact 2. The contacts 1 and 2 are arranged to engage within an insulating casing 3 which forms a switching chamber 4 and a passage 5 leading thereto from the source of automatic pressure. The fixed contact 1 is connected to a switch terminal 1' and the rod contact 2 is likewise suitably connected through a sliding contact to the other switch terminal 2'.

The control of the pressure gas can be effected, for example, so that the compression chamber of the switch is closed with respect to the arcing contacts by means of a valve, or the like, which is opened only when the switch contacts have been separated a predetermined extent or have reached a particularly favorable position for the arc extinguishing operation. At this moment the gas passage to the arcing contacts may be opened in accordance with the contact movement or in accordance with the pressure in the compression chamber, or in accordance with the position of the pressure producing piston, and the gas blast at the arcing contacts be effected in a short time utilizing the total energy available for this purpose.

To this end the casing 3 is provided with a cylinder 6 which is in communication with the passage 5 only through a valve 7 normally biased by spring 8 on its seat at 9. The valve stem 10

projects beyond the valve proper at 10' into the cylinder 6, the other end of the valve stem being guided in the casing 3 and provided with means at 11 for adjusting the length of the valve stem exteriorly of the casing.

A piston 12 is mounted within the cylinder 6 and is operatively connected through piston rod 13, lever 14, and insulating link 15 to the movable contact 2. Operation of the lever 14 is effected by the shaft 16 connected to suitable actuating means (not shown). With the switch in the closed circuit position shown, operation of the lever 14 in counter-clockwise direction causes downward or opening movement of the contact 2 and an upward stroke of piston 12 compressing the gas within the cylinder 6. However, no blast is directed between the contacts until the piston 12 abuts and moves the valve stem extension 10' upwardly, thereby opening the valve 7 and causing at that instant a blast of gas under pressure through the passage 5 and across the arc at the contact 1. Accordingly, since the movable contact and piston are operatively connected the gas blast may be considered as directed either in accordance with the position of the movable contact or the position of the piston.

Through the use of the special control member, as the valve 7, it is likewise possible to make the intensity of the gas blast particularly favorable and suitable during the period of arc interruption, for example in such a manner that at the beginning the blast can be kept somewhat weaker and then strengthened, or vice versa, or be maintained constant during extinguishing of the arc. In contrast with this, in prior types of pressure gas switches with automatic compression a relatively strong blast is created at the beginning of the operation and, as the amount of the pressure gas available is small, the blast decreases considerably towards the end of the interrupting operation. It is, therefore, not only possible in accordance with my invention to limit the gas leakage losses to an extent approaching the ideal condition, but also to obtain the ultimate maximum of interrupting capacity with a given work of compression.

As regards the heating of the contacts and insulating parts of the switch, it is likewise advantageous to direct the gas blast through the arc only at the contact position most favorable to arc extinction, since the voltage and the heat

generated by the arc can be kept small at the beginning of the operation.

The time at which the gas blast is applied with respect to separation of the contacts can be determined by adjusting the length of the valve stem at 11 so that the stem extends a greater or less extent into the cylinder 6. The stem 10, of course, may be adjustably secured to the valve 7 such as by screw threaded engagement so that rotation of stem 10 causes longitudinal movement of the stem with respect to the valve.

In another form the valve control may be in accordance with the pressure developed in the cylinder 6, for example the valve 7 being opened in response to a predetermined pressure developed by the piston 12. It will be apparent that the valve spring 8 may be suitably adjusted to provide for opening under varying conditions.

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 electric circuit breaker of the gas blast type comprising relatively movable contacts, a piston for compressing a quantity of gas, means operatively connecting said piston and contacts, a valve for controlling release of said gas to a point of contact separation for extinguishing arcing, means for causing positive opening of said valve in accordance with a predetermined position of said piston, and means for adjusting said last-named means for varying said predetermined position.

2. An electric circuit breaker of the gas blast type comprising relatively movable contacts, a piston for compressing a quantity of gas operatively connected to one of said contacts, means forming a passage between said piston and the point of contact separation, a valve biased normally to close said passage, means operatively connected to said valve causing positive opening thereof in accordance with a predetermined position of said last-named contact, and means for varying the opening of said valve with respect to said contact and piston.

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