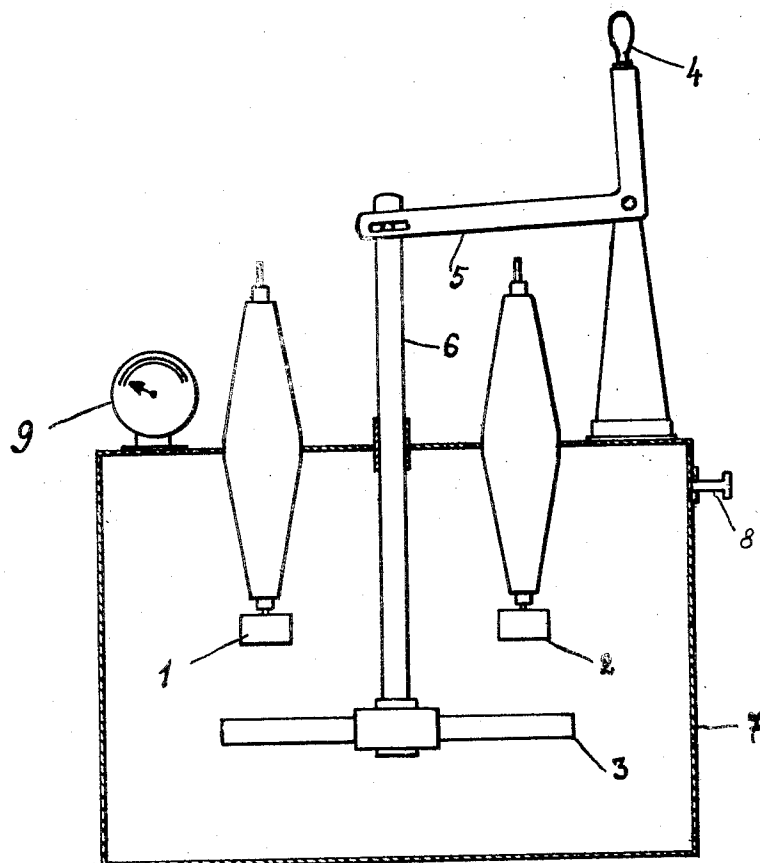


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ELECTRIC SWITCH
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UNITED STATES PATENT OFFICE

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ELECTRIC SWITCH

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This invention relates to electric switches and more especially to those intended to deal with high tension currents. In such switches it has hitherto been proposed to dispose the contacts between which the interruption of the circuit is to take place, within an enclosure filled with gas under pressure. These devices, however, have not shown themselves to be satisfactory in practice owing to the difficulty involved in manufacturing suitable apparatus and owing to the relatively high cost of continuously maintaining the gas pressure within the enclosure.

The present invention has for its object the provision of a switch operating within a gas-filled enclosure which, in the majority of cases, will not require the use of compressed gas and even when the voltage on the circuit is very considerable only requires the use of a gas subject to a relatively small pressure which is easy to produce and maintain.

Hitherto no satisfactory means for preventing the ready occurrence of discharge in compressed gases, on the interruption of the current circuit, has been found, nor has it been found possible to make this discharge less marked. Experiments give rise to the assumption that such behaviour depends mainly upon the reduction in the speed of movement of the ions which is produced by the compression.

According to the present invention a high tension electric switch is constructed within a chamber filled with a gas at low pressure having a speed of ionic movement capable of providing similar conditions to those of gaseous fluid in like circumstances, but at a higher pressure. Preferably the gas which is employed within the enclosure containing the switch contacts has, at the maximum pressure allowable, the same speed of ionic movement as that which air would have when compressed to the pressure necessary to attain a satisfactory break of the circuit in air.

The single figure of the accompanying drawing is a schematic vertical section of one form of apparatus in which the invention can be carried out.

Referring to said drawing, the switch, of

appropriate type, is represented schematically by the fixed terminals 1—2, which co-operates with a connecting bar 3, controlled from the outside by means of a movable device 4—5—6, disposed within a closed receptacle 7, provided with a nipple 8 through which the gas to be employed can be introduced, and with a manometer 9 which enables the pressure of the gas to be watched. All these parts can be constructed and arranged in any suitable manner, according to each special case to be considered; the invention relating exclusively to the chemical and physical nature of the gas introduced into the receptacle, according to the results sought to be attained, independently of the nature and operation of the apparatus.

Preferably the gas to be employed is an organic compound possessing a molecular weight which is greater than 30.

The speed of movement of the ions is, as is known, determined in terms of the velocity in centimetres per second which the ions attain when they are subjected to the action of an electric field of one volt per centimetre. The velocity varies with the temperature and pressure and has a characteristic value for every gas. In the case of dry air at 15° C. and 760 mm., the average velocity of movement of the ions is equal to $K=1.62$.

Experiment shows that the velocity of movement of the ions in the case of different substances is dependent upon their molecular weights in accordance with a complex law, and in the case of organic gases is approximately in the inverse ratio to the 0.7 power of the said molecular weight. In every gas the velocity of movement becomes less with increasing molecular weight and it is less than 1 in almost all organic gases, since all these have a molecular weight greater than 30. If such gases as are used possess at normal pressure a travel speed which is less than 1, then they will behave like compressed air at 1.6 atmospheres. If, for example, one uses vapors of carbon tetrachloride for which $K=0.3$ then one obtains the same effect as in the case of air at 5 atmospheres pressure.

A number of substances having desirable

electrical characteristics and suitable for use in accordance with this invention may be found in a table appearing on page 125 of Thomson, 3rd edition.

When selecting the gas to be employed, its physical and chemical properties are, naturally, considered, and those for example which are poisonous as well as those which dissociate or which may attack metals will be rejected. Also those which for any other technical reason are unserviceable will be rejected although they may have a molecular weight higher than 30, and in every case an examination will be made in order to see if the speed of ionic movement of the gas to be used for the purpose in view is sufficiently higher than that of air in order to obtain the contemplated reduction of pressure.

What I claim is:

1. A high tension electric switch, comprising a gas-tight chamber enclosing the electrodes of the switch, the chamber containing a gas which has a middle specific mobility of the ions lower than 0.8.

2. A switch as set forth in claim 1, the gas within the chamber comprising a gaseous hydrocarbon compound having a molecular weight higher than 30.

3. Means for extinguishing an electrical arc comprising a gas surrounding the arc, said gas having at atmospheric pressure a middle specific mobility of the ions lower than 0.8.

4. Means for extinguishing an electrical arc comprising a gas surrounding the arc, said gas comprising a gaseous hydrocarbon compound having a molecular weight higher than 30 and having at atmospheric pressure a middle specific mobility of the ions lower than 0.8.

5. Means for extinguishing an electrical arc comprising a gas surrounding the arc, said gas having at atmospheric pressure a middle specific mobility of the ions approximating 0.3.

6. An apparatus for drawing and extinguishing an electrical arc comprising electrodes, a gaseous medium surrounding the electrodes, said gas having at atmospheric pressure a middle specific mobility of the ions lower than 0.8.

7. An apparatus for drawing and extinguishing an electrical arc comprising electrodes, a gaseous medium surrounding the electrodes, said gas comprising a gaseous hydrocarbon compound having a molecular weight higher than 30 and having at atmospheric pressure a middle specific mobility of the ions lower than 0.8.

8. An apparatus for drawing and extinguishing an electrical arc comprising electrodes, a gaseous medium surrounding the electrodes, said gas having at atmospheric

pressure a middle specific mobility of the ions approximating 0.3.

In testimony whereof I affix my signature.

FRANCESCO PERROTTI.

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