A method of controlling the growth process of a sliding spark along the surface of a film dielectric by introducing emission centers from chemical compounds with a low electron work function into the surface is presented. It is shown that it is possible, by using this method, to produce a spark channel with sharp corners, such as a Z-shaped channel, and an ordered system of parallel channels, as well as a strictly rectilinear channel up to 2 m long. It is established that the rate of growth of the sliding spark is nonuniform. The mean rate is heavily dependent on the overvoltage, which is related to a reduction in the pauses in its growth.

A sliding spark is generated on the surface of a dielectric when a pulsed or high-frequency voltage is applied to electrodes located on the surface if there is a conductor under the dielectric layer. These sparks are generated in high-voltage techniques and are undesirable from the point of view of electrical insulation [1-3]. It is, however, extremely interesting to use the sliding spark as a means of initiating frequently repeated discharges over long discharge lengths and as linear or specially shaped high-luminosity emission sources. In addition, plasma surfaces can be formed by using the capacity to produce a parallel system of spark channels, which is important in, for example, the study of the interaction between a plasma and a dielectric surface in contact with it. In this case, in particular, the action of the plasma on the structural members of the piece of apparatus which enter the atmosphere can be simulated [4]. The aim of this paper is to devise a procedure for controlling the growth of sliding sparks and to form a system of parallel channels in the complete (high-current) discharge phase.

Sliding discharges are formed on the plane surface of a film dielectric covering a metallic sheet (the initiator). Two linear electrodes 32 cm long are placed parallel on the surface of the dielectric with the distance between them being variable from 12 to 100 cm. One of the electrodes is connected to the initiator. In separate experiments the distance between the electrodes reaches 800 cm. In these experiments the initiator is a metal cylinder enveloped in a dielectric film and the electrodes are annular in shape.

A voltage pulse is fed when the capacitor discharges ($C = 12 \, \mu \text{F}, u_0 = 3-20 \, \text{kV}$) to the first winding of the cable transformer which has one turn. The secondary winding has 10 turns so that a maximum voltage amplitude of up to 210 kV is possible. The voltage takes the form of a damped cosine curve with a period of 12-18 $\mu \text{sec}$. Polyethylene, polyethylene terephthalate, cellulose acetate, etc., films are used as the dielectric over the surface of which the discharge is generated. The thickness of the film is varied from 0.16 to 3 mm.

Space-time base scans of the luminescence of spark channels are mapped and photographed in this paper and oscillograph traces are taken of the voltage between the electrodes.

It is a well-known fact [5, 6] that the presence of small inhomogeneities in the discharge gap has a significant influence on its breakdown. This is an initial premise for the development of a method of controlling sliding spark growth. During the course of the investigations it is found that the determining factor is not so much the local distortion of the electrical field at the point where the inhomogeneity is located (a metallic powder, for example, is used) as the work function of electrons from the material of this inhomogeneity. (Control is stable when the polarity of the first half-period of the voltage in the gap is positive.) Finely disperse powders of graphite, aluminum powder, $\text{BaSO}_4$, $\text{BaO}_2$, $\text{ZnO}$, $\text{Cu}_2\text{O}$, $\text{TiO}_2$, etc., are used as the material for generating this kind of inhomogeneity. The best results are obtained with barium compounds which have a very low