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# FOREIGN TECHNOLOGY DIVISION



HIGH-VOLTAGE SPARK GAP

by

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## EDITED TRANSLATION

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Block	Italic	Transliteration	Block	Italic	Transliteration
А а	<i>А а</i>	A, a	Р р	<i>Р р</i>	R, r
Б б	<i>Б б</i>	B, b	С с	<i>С с</i>	S, s
В в	<i>В в</i>	V, v	Т т	<i>Т т</i>	T, t
Г г	<i>Г г</i>	G, g	У у	<i>У у</i>	U, u
Д д	<i>Д д</i>	D, d	Ф ф	<i>Ф ф</i>	F, f
Е е	<i>Е е</i>	Ye, ye; E, e*	Х х	<i>Х х</i>	Kh, kh
Ж ж	<i>Ж ж</i>	Zh, zh	Ц ц	<i>Ц ц</i>	Ts, ts
З з	<i>З з</i>	Z, z	Ч ч	<i>Ч ч</i>	Ch, ch
И и	<i>И и</i>	I, i	Ш ш	<i>Ш ш</i>	Sh, sh
Й й	<i>Й й</i>	Y, y	Щ щ	<i>Щ щ</i>	Shch, shch
К к	<i>К к</i>	K, k	Ъ ъ	<i>Ъ ъ</i>	"
Л л	<i>Л л</i>	L, l	Ы ы	<i>Ы ы</i>	Y, y
М м	<i>М м</i>	M, m	Ь ь	<i>Ь ь</i>	'
Н н	<i>Н н</i>	N, n	Э э	<i>Э э</i>	E, e
О о	<i>О о</i>	O, o	Ю ю	<i>Ю ю</i>	Yu, yu
П п	<i>П п</i>	P, p	Я я	<i>Я я</i>	Ya, ya

\*ye initially, after vowels, and after ъ, ь; e elsewhere.  
When written as ë in Russian, transliterate as yë or ë.

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	sinh <sup>-1</sup>
cos	cos	ch	cosh	arc ch	cosh <sup>-1</sup>
tg	tan	th	tanh	arc th	tanh <sup>-1</sup>
ctg	cot	cth	coth	arc cth	coth <sup>-1</sup>
sec	sec	sch	sech	arc sch	sech <sup>-1</sup>
cosec	csc	csch	csch	arc csch	csch <sup>-1</sup>

Russian English

rot curl  
lg log

GRAPHICS DISCLAIMER

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## HIGH-VOLTAGE SPARK GAP

V.N. Bondaletov and R.I. Golitsyn

The invention belongs to the field of technology of high voltages and can be used as a switching element for a spark gap of powerful low-inductive capacitor banks.

Designs of spark gaps containing two main electrodes and ignition electrodes are being used at present for the switching of capacitive energy storages.

A shortcoming of these spark gaps is the considerable magnitude of their active and inductive resistances. Therefore, the use of such spark gaps for the switching of low-inductive capacitor banks leads in certain cases to an inadmissibly large increase in the inductive and active resistances of the discharge circuit.

The purpose of the invention is to decrease the inductive and active resistances of the discharge circuit and increase the

reliability.

This is achieved in that the basic discharge electrodes are made in the form of plane-parallel buses, and the surface of the ignition electrode has a toothed form, which furthers the sharp distortion of the field between the main electrodes with feed to the ignition electrode of initiating voltage and development of parallel discharges from the teeth.

Figure 1 shows the spark gap described in general view; Fig. 2 shows the form of the teeth of the ignition electrode; and Fig. 3 shows the electrical circuit which switches on the spark gap.

The spark gap (see Fig. 1) consists of two main electrodes 1 and 2, an ignition electrode 3, insulating spacers 4, and a common bus 5.

The following make up the electrical circuit for switching on the spark gap (see Fig. 3): voltage divider with resistors 6 and 7, a device to feed the initiating voltage to the igniting electrode 8, a load 9, and a capacitive energy storage element 10.

The capacitive energy storage element is charged by a negative voltage  $V_1$ .

The potential of the igniting electrode (by means of the voltage divider) and its location with respect to the main electrodes are selected so that the field is close to uniform. When a positive initiating voltage  $U_1$ , with an amplitude not lower than the operating voltage of  $U_1$ , is fed to the igniting electrode, a 15-20-fold overvoltage is created. This is explained by the fact that the uniform field with the breakdown voltage is divided into two sections with sharply nonuniform fields. Furthermore, the total voltage is doubled, and the gap is divided into two more short ones.

A change in the field from a practically uniform to a sharply nonuniform field with a simultaneous decrease in the length of the gaps and increase in the applied voltage ensures the appearance of parallel discharges.

Thus the path of the current with switching of the charged capacitor is accomplished along four channels (in this case the igniting electrode has four teeth). Inductive and active resistances of each channel are included in parallel to each other, and the common inductive and active resistances of the discharger, consequently, of the whole discharge circuit are considerably decreased.

In this case the voltage to the igniting electrode is fed to one



point from one source of the initiating pulse, for example, a segment of the cable.

Claim of the Invention

A high-voltage spark gap, which contains two main electrodes and an igniting electrode, which is distinguished by the fact that for decreasing the inductive and active resistances and increasing the reliability, the indicated igniting electrode is made of toothed form.

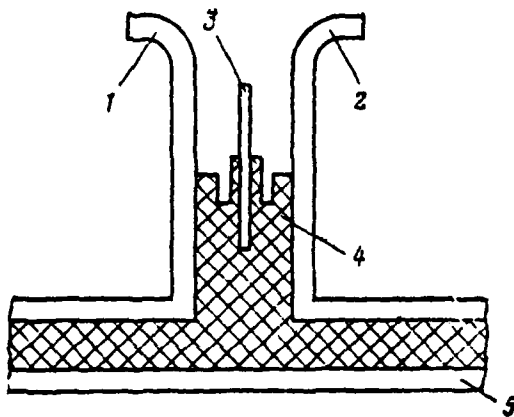
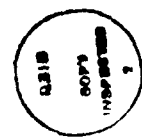


Fig. 1.



Fig. 2.



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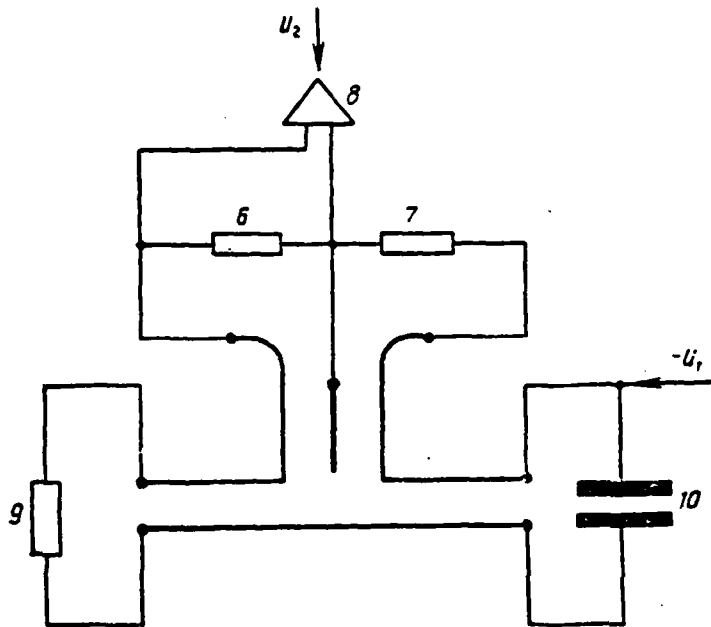


Fig. 3.