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AN ULTRASONIC UNIT FOR COATING OXIDE AND OTHER TYPES OF CATHODE--ETC(U)
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AN ULTRASONIC UNIT FOR COATING OXIDE
AND OTHER TYPES OF CATHODES

By

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

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

RUSSIAN AND ENGLISH TRIGONOMETRIC FUNCTIONS

Russian	English	Russian	English	Russian	English
sin	sin	sh	sinh	arc sh	$\sinh^{-1}$
cos	cos	ch	cosh	arc ch	$\cosh^{-1}$
tg	tan	th	tanh	arc th	$\tanh^{-1}$
ctg	cot	cth	coth	arc cth	$\coth^{-1}$
sec	sec	sch	sech	arc sch	sech^{-1}
cosec	csc	csch	csch	arc csch	csch^{-1}

Russian	English
rot	curl
lg	log

AN ULTRASONIC UNIT FOR COATING OXIDE AND OTHER TYPES OF CATHODES

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This article describes the unit for obtaining high-quality coatings and gives the test results.

Today higher demands are being placed on the quality of the oxide coatings of cathodes for a number of electrovacuum devices, for example, for the receiving and transmitting television tubes of the UHF devices (powerful high-voltage klystrons, pulsed magnetrons, double-stream amplifiers, tubes with a short spacing between the cathode and grid, etc.). The oxide coating of the cathodes of such devices must have minumum roughness (limited only by the grain dimensions of carbonates), a density of up to 3 g/cm^3, and a thickness in the range of 20–60 μm.

One of the methods used extensively for the application of the oxide layer onto the base surface is spraying of a suspension by means of compressed air with the aid of an atomizer of the various systems. Under the industrial conditions, in coating cathodes with an air atomizer the roughness reaches 15 μm with the grain size from 2 to 3 μm and density of up to 2 g/cm^3.

A significant drawback of this method is the inability to obtain a roughness, which is limited only by the grain size of the carbonates from which the suspension is prepared due to the presence of the grain conglomerates. A large amount of "peaks" and "valleys" formed during the oxidation process has been observed on the surface of the oxide coating magnified several tens of times under a microscope. These formations elicit a number of undesirable occurrences which lead to a decreased reliability of the devices and their shorter service life, for example, microbreakdowns, local overheating, sparking, etc. Furthermore, a high-pressure air stream (up to 4 atm) used in atomization carries with it a large number of particles which cause a microscopic contamination. These particles seemingly "impregnate" the oxide coating and, by burning during the cathode activation, worsen its parameters.

Ultrasonic atomization does not have these shortcomings. It is known that spraying of various liquids (water, oil, etc.) is possible by means of an ultrasound, and also the dispersion of solid bodies, i. e., their fine pulverization and mixing with another substance. One form of dispersion is the dispersion of solid substances in liquid (hydrosols). This, indeed, is the property that is used in the ultrasonic coating of cathodes.

Figure 1 shows a functional diagram of an ultrasonic device for coating the oxide and other types of cathodes and Fig. 2 shows a magnetostrictive vibrator (ultrasonic atomizer without a water cooling jacket).

An injector with a capacity of 2 or 10 cm^3, connected to the connection of the concentrator by means of a rubber tube and which is installed in a special tray in horizontal position, was used as the vessel to supply the suspension. The plunger of the injector is displaced by an electrical motor by means of a mechanical gear which ensures the necessary accuracy in feeding the suspension and the quality of the coating. The latter depends also on the suspension parameters (viscosity, grain size, etc.). A coaxial shield made of glass, which is installed between the concentrator and the frame with a cathode, is used to protect a finely dispersed suspension fountain fron the effect of the surrounding air.

The mechanism which supplies the suspension operates in the following manner: when the electric motor of the feed mechanism is turned on the plunger of the injector moves and the suspension flows onto the vibrating face surface of the concentrator through an elbow-type channel where it transforms into a finely dispersed fountain directed upwards. The frame with a cathode being oxidized is placed in the path of the fountain. When the end-type cathodes are oxidized it rotates at a given rate by the electric motor and a reciprocating movement is communicated to the frame in a horizontal plane when flat cathodes are oxidized.

Figure 3 shows a mock-up of the installation (without the feed mechanism) for the oxidation of the end-type cathodes of small dimensions, while Fig. 4 shows a mock-up of a device for coating flat cathodes of large dimensions.

The experiments and practice in coating metal discs 20–135 mm in diameter and the end-type cathodes of kinescopes 2 and 3 mm in diameter have shown that the coatings prepared using ultrasound have considerably better parameters than those prepared by means of air atomization. Thus, the coating roughness comrised 2–3 μm, while density - 3 g/cm^3.

It is necessary to note that the installation described above can be used not only for obtaining oxide cathodes but, in numerous other cases, when smooth and dense coatings are required. For example, the use of the developed ultrasonic device for coating the backings with a photoresist is promising in the production of thin-film and integral microsystems, etc. Furthermore, in addition to improvement in the quality of the coating and a decrease in the expenditure of the photoresist (as compared with centrifugation), the process can be automated.

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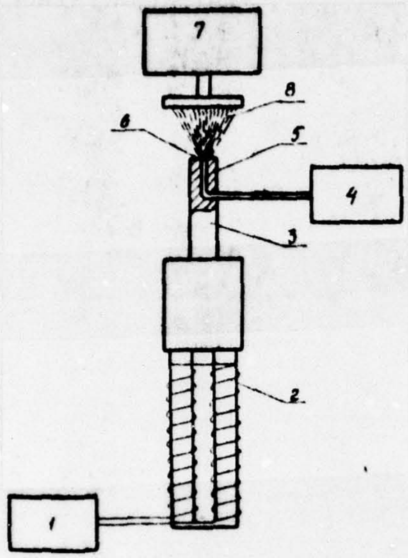

Fig. 1. Functional diagram of an ultrasonic device for obtaining important coatings:

1 - ultrasonic generator of 200-400 W capacity; 2 - magnetostrictive vibrator; 3 - stepped concentrator (acoustic transformer); 4 - suspension feed mechanism; 5 - geniculate channel bored in the thickness of the concentrator through which the suspension is fed to the vibrating face portion of the concentrator; 6 - face of the concentrator; 7 - electric motor with a holder for backings; 8 - fountain of a finely dispersed suspension.

Fig. 2. External view of an "ultrasonic atomizer":

1 - core; 2 - winding; 3 - concentrator; 4 - connector for the introduction of suspension for the feed mechanism.

Fig. 3. Ultrasonic device for coating end-type cathodes:

1 -housing; 2 - magnetostrictive vibrator; 3 - concentrator face; 4 - glass shield; 5 - frame with cathodes; 6 - electric motor.

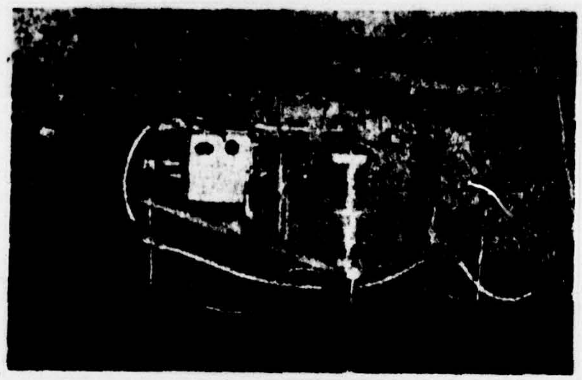

Fig. 4. Ultrasonic installation for coating flat cathodes of large dimensions:

1 - ultrasonic generator; 2 - support; 3 - suspension feed mechanism; 4 - injector with suspension; 5 - concentrator; 6 - connecting rubber tube; 7 - magnetostrictive vibrator; 8 - glass shield; 9 - frame with cathodes; 10 - electric motor for displacing the frame.

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