Universal Device for Drop-Time Control Working on the Electrodynamic Principle

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A device for drop-time control designed on the electrodynamic principle is described. The drops can be torn off with a frequency of up to hundreds of c/s. The system can work either as a standard drop-time control or as a vibrating electrode. Compared with the existing devices working on the electromagnetic principle this novel drop-time control distinguishes itself by its noiseless operation and small dimensions.

In order to increase the accuracy and reproducibility of measurements a forced detachment of drops is used in oscillographic polarography. All the latest commercially manufactured Křižík oscillopolarographic instruments are equipped with drop detacher. For special requirements, i. e. for obtaining stable oscillopolarograms, so-called vibration drop detachers have been developed which are described in more detail in the papers [1, 2]. In essence, this involves detachment of drops always after each cycle of the polarizing process, i. e. 50-times per second with commercial oscillopolarographs. All the above mentioned drop detachers work on the electromagnetic (moving-iron) principle. The electromagnet attracts the armature of magnetic material, to which a capillary is rigidly connected, and thus tears off the drop.

For the oscillopolarograph developed in our laboratory [3] we have used a single drop detacher on the electrodynamic (moving-coil) principle which fulfils both functions according to the mode of power supply. It works either as a standard drop detacher ($t = 0.5 - 10$ seconds) or as a vibrating electrode synchronized with the polarizing process. In the second case, detachment of the drop occurs either after each cycle of the polarizing process, or after two or three cycles.

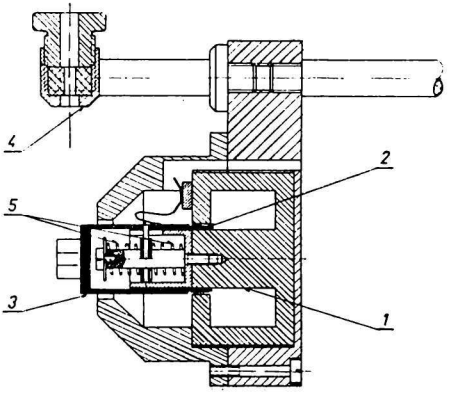

Fig. 1. Sectional view of drop detacher. *1.* permanent magnet; *2.* oscillating coil; *3.* oscillating coil former; *4.* capillary holder with rubber packing; *5.* cylindric springs.

A sectional view of the instrument is to be seen in Fig. 1. The magnetic circuit is formed by a pot-shaped permanent magnet. (We availed ourselves of the magnet from a dynamic loudspeaker.) In its magnetic field moves a small coil, wound on a light former of organic glass, rigidly connected to a capillary. The directive force is provided by two cylindric springs inside the coil shell. In comparison with other principles, the system described here features two main advantages:

a) the moving parts have little inertial mass and allow for passing over higher frequencies when the instrument is being used as a vibrating electrode;

b) no metal parts are striking anywhere against one another, therefore the drop detacher is working noiselessly.

As an example of application of drop detacher as a vibrating electrode we show in Fig. 2 and Fig. 3 several stable oscillopolarograms of a solution of cytidylic acid of

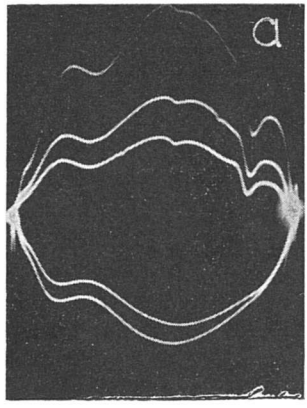

Fig. 2. Oscillopolarogram $dE/dt = f(E)$ cytidylic acid. Detachment of drop synchronized with every third cycle of polarizing current.

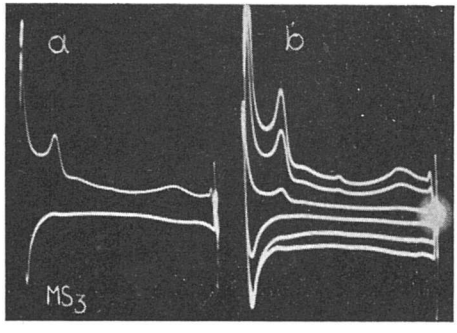

Fig. 3. Oscillopolarogram I $f(E)$ cytidylic acid.
a) detachment of drop synchronized with every cycle of the polarizing voltage;
b) detachment of drop synchronized with every third cycle of polarizing voltage.

$5\ 10^{-4}$ M concentration in the supporting electrolyte of ammonium formate of 0.3 M concentration with pH 5.6 phosphate buffer. Stable oscillopolarograms inform rapidly of indentations making photographic record unnecessary. They are, however, no substitutes of the more precise method of the first curves.

UNIVERZÁLNY ODTRHOVAČ KVAPIEK NA ELEKTRODYNAMICKOM PRINCÍPE

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Opisuje sa nový typ mechanického odtrhovača kvapiek, založeného na elektrodynamickom princípe. Uvádza sa technický nákres tohto zariadenia.

УНИВЕРСАЛЬНАЯ УСТАНОВКА ДЛЯ РЕГУЛИРОВКИ ПЕРИОДА КАПАНИЯ С ИСПОЛЬЗОВАНИЕМ ЭЛЕКТРОДИНАМИЧЕСКОГО ПРИНЦИПА

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Описывается новое устройство для механического отрыва капель, основанное на электродинамическом принципе.

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