A new type of tank for paper microelectrophoresis of proteins from biological fluids

The electrode vessels in the apparatus described here serve at the same time for stretching the paper strips. The construction of the entire unit is so simple that it can be easily assembled in any laboratory.

The tank serving as wet cell for electrophoresis consists of two vinidur photographic cuvettes 525 mm by 625 mm. A shallow dish with water placed on the bottom of the tank provides moisture.

A vinidur photographic cuvette was used for the first time for this purpose by MONCKE (according to BÜCHNER AND GABSCH[1]) but he covered the cuvette with a glass plate. We use for the same purpose a second photographic cuvette of the same size but inverted, the bottom of which is replaced by a glass plate in a metal frame inclined at about 20° as a protection against drops of condensed water falling on the

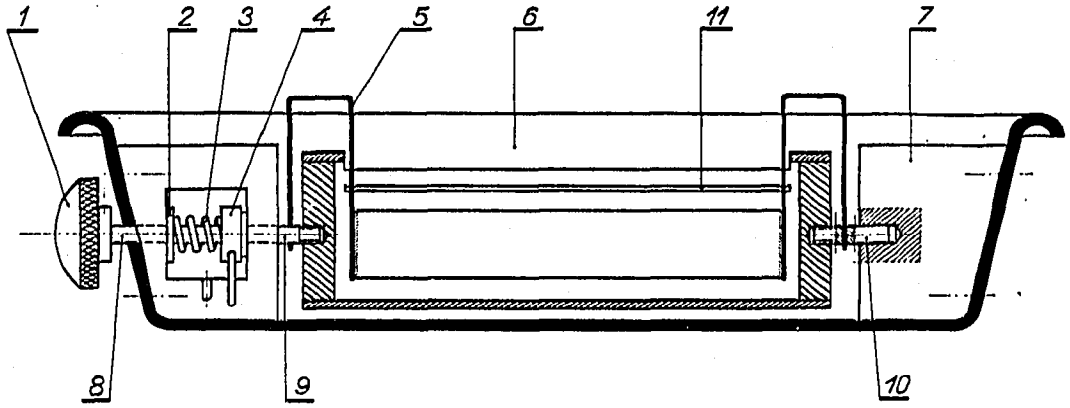

Fig. 1. Cross-section of the tank for paper microelectrophoresis. 1 = knob; 2, 3, 4, 8 = parts of the spring coupling; 5 = electrode; 6 = electrode vessel; 7 = support; 9, 10 = axles of the electrode vessel; 11 = slot for paper strips.

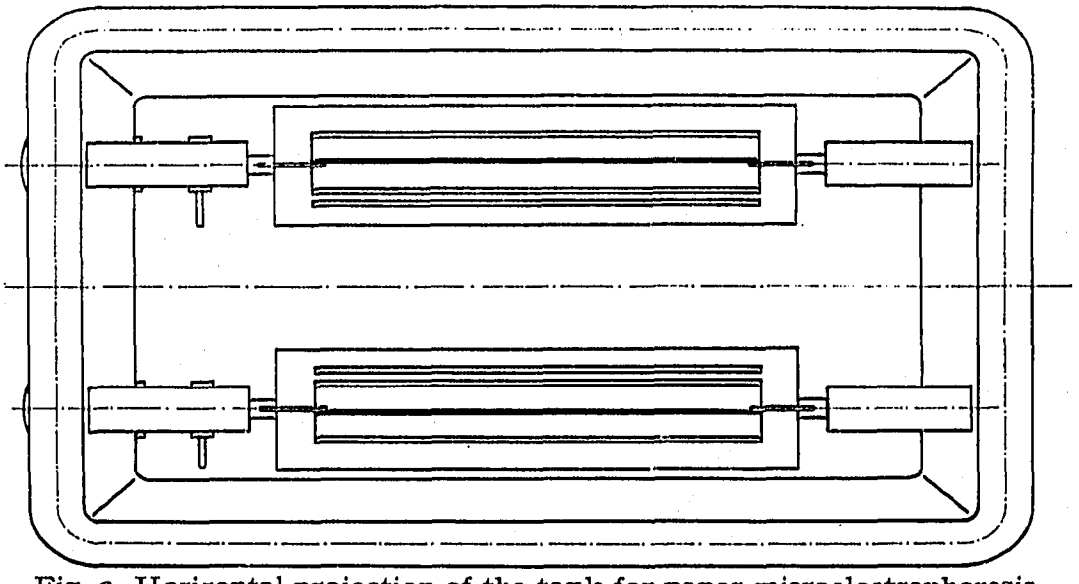

Fig. 2. Horizontal projection of the tank for paper microelectrophoresis.

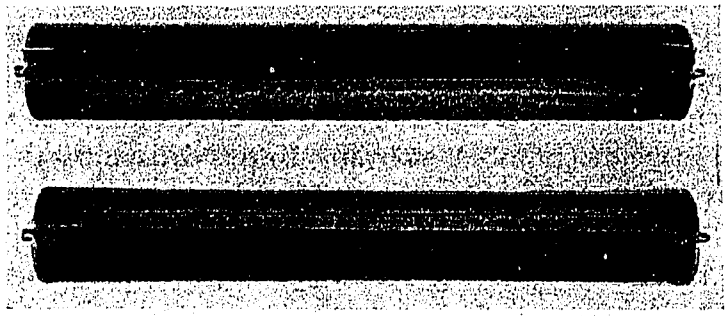

Fig. 3. Electrode vessel (the upper vessel with electrode).

strips. The electrode vessels are suspended on special vinidur supports on the sides of the tank. The vessels are provided with knobs for turning and with spring couplings which allow fixation of the vessels and their easy removal (Figs. 1 and 2).

Electrode vessels

These are designed to hold and at the same time to stretch the paper strips (Figs. 3 and 4). Thus special frames for holding the strips, which so often tear the wet paper,

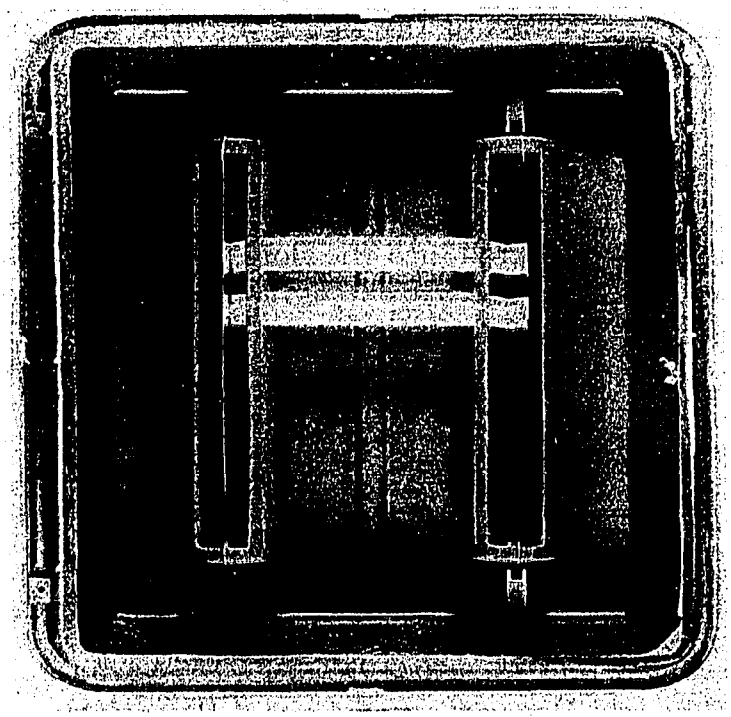

Fig. 4. Microelectrophoresis tank with stretched paper strips (seen from above).

are unnecessary. The vessels are made of vinidur tubing 50 mm in diameter and 380 mm long. Both ends of the tube are closed with a vinidur disc 50 mm in diameter and 10 mm thick. The discs are sealed on the tube with vinidur glue Pc 2, which gives absolute security against leakage.

The tubes are provided with an opening in their upper side. This opening, 30 mm by 370 mm, serves to fill, empty and clean the vessel and to put in the electrode. Each vessel has a volume of approx. 300 ml.

A narrow slot, 370 mm long and 1 mm wide, is cut out in the side of the tube at a distance of about 7 mm from the longer edge of the opening and parallel to it. The ends of the paper strips are inserted in the slots of both electrode vessels and the strips are then stretched between them. A starting line is drawn by pencil on the strips at a distance of 8.5 cm from the end of the strip[2]. The slots can hold 10 strips of 3 cm width and 28 cm length. With a medinal–acetic acid[2] buffer and a potential gradient of 5 V per cm of length and a current gradient of 0.3 mA per cm of width the protein fractions of the serum are separated along a section of the strip measuring approx. 9 cm.

The electrodes

The electrodes are made of highly resistant stainless steel produced in Poland*. They measure 40 mm by 360 mm with a rather large surface of 144 cm^2. After polishing they are apt to become corroded by concentrated hydrochloric acid, therefore no buffer containing this acid should be used as the liberated chlorine anions might injure the anode.

The electrodes are attached on both sides to the couplings and supports by wire made of the same steel. Wire and electrode must be electrically welded. The electric current is fed through the centre of the knobs and the axle of the coupling which assures a ready change of polarity after each run and a safe contact between electrode and electric pole.

Stretching of the strips

The vessels are filled with buffer solution and the electrodes are put in place. The dry ends of the paper strips are inserted into the slots, care being taken that the starting line and the polarity of the electrodes are in agreement. After the entire length of the strips has become soaked with buffer from both vessels one can proceed to stretch them. One of the vessels, *e.g.* the right hand one is turned by knob 30° towards the middle of the tank while the other remains fixed in position by its coupling. One must then wait until an equilibrium between the suction of the buffer at both ends of the strip is reached (with a Macherey-Nagel filter No. 61 this takes about 60 minutes[3]). Then the vessel is turned back by knob until resistance is felt. The strips are now sufficiently stretched and the runs can be started by depositing drops of the solution being investigated on the starting line in the normal way.

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* The use of this steel was suggested by Professor E. ZUBIK.