Apparatus for Semimicro Electrodialysis

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In the course of experiments dealing with the purification and isolation of histamine from small amounts of biological fluids, we were in need of a suitable electrodialysis apparatus. The requirements to be met were: small capacities of the chambers, efficient cooling of the electrode compartments, rapid assembly and disassembly, and all-glass construction. Since such an apparatus was not available commercially, we designed and constructed one which fulfills the above requirements. We believe that the apparatus described, which has given entirely satisfactory service, may be of value also in other work in which electrodialysis is employed.

The capacity of the apparatus can be modified by the use of different sizes of joints and tubing.

To assemble the apparatus, electrodes are introduced through the male joint opening and fastened by a rubber

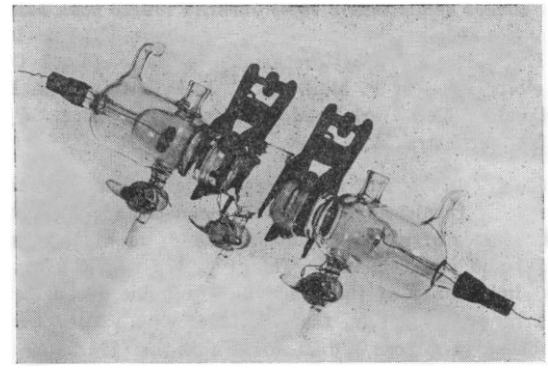

FIG. 2. Assembled electrodialysis apparatus.

sleeve over D. Alternately, a ground joint at D with sealed-in lead wire can be employed with a smaller electrode. The male joints are then lightly lubricated with

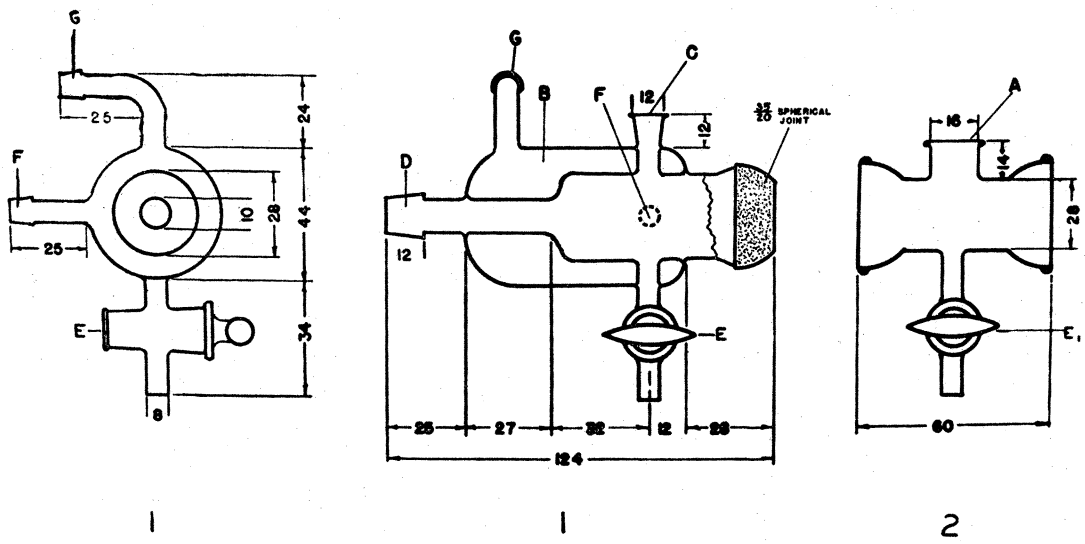

FIG. 1. Diagram of electrodialysis apparatus: 1, electrode chamber; 2, middle chamber. All dimensions in mm. Tubing measurements—outside diameter.

The apparatus is constructed from 35/20 Pyrex spherical joints on 28-mm tubing (Fig. 1). The middle chamber consists of two female joints, sealed together and provided with an opening (A) wide enough to admit a stirrer and stopcock (E_1) for drainage. The electrode compartments are constructed as shown in the drawing, using the male joints to connect to the middle chamber. Efficient cooling is assured by the cooling jacket (B) into which the electrode chamber is sealed. Chamber intake (C), stopcock (E), and electrode lead-channel (D) of the electrode chamber are sealed through the cooling jacket, which is provided with cooling water intake (F) and outflow (G). The top capacity of the middle chamber is 20 ml, and volumes as low as 5 ml may be dialyzed.

silicone stopcock grease. Semipermeable membranes, cut circularly with a diameter not more than 2–3 mm greater than the inside diameter of the male joint, are soaked in water and laid on the joint, and the female half of the middle compartment is pressed in and firmly attached with a Thomas spherical joint spring clamp (#3421).[1] The other electrode is attached in a similar manner and the assembly shown in Fig. 2 transferred to a suitable support. A water hose is attached to one intake (F). Cooling water outflow (G) is connected to intake (F) on the opposite electrode chamber and the water led away from the outflow (G) on the same side.

[1] Obtainable from Arthur H. Thomas Company, West Washington Square, Philadelphia, Pennsylvania.