

CENTRIFUGAL CHROMATOGRAPHY

IV. A SIMPLE DISTRIBUTOR FOR CENTRIFUGAL CHROMATOGRAPHY*

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(Received January 17th, 1962)

The majority of hitherto published papers dealing with centrifugal chromatography show¹⁻⁴ that McDONALD'S apparatus has found applications in chromatographic separation. We have previously⁵ pointed out some disadvantages of this system. Both McDONALD'S method of excentric overpressure feeding of the mobile phase and the central spot distributor of PAVLÍČEK *et al.*⁵ have the same drawback, *viz.* the time-consuming and complicated manner in which feeding of the mobile phase from the reservoir takes place. With the arrangements used it is difficult to change the mobile phase rapidly (using the same distributor), which is essential for multi-purpose application of the centrifugal chromatograph.

The mobile phase distributor constructed by TATA AND HEMMINGS⁶ is simple, but does not permit changing of the mobile phase during the chromatographic process (*e.g.* gradient elution).

The aim of this paper is to describe a simple central-type distributor for the

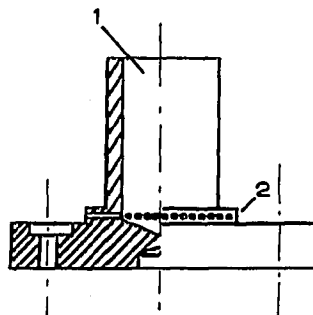


Fig. 1. Mobile phase distributor – sectional view. 1 = hollow space of the distributor – for mobile phase and porous material (glass wool); 2 = system of capillary hollows.

mobile phase, which, in contrast with previous types, permits the mobile phase to be changed rapidly. At the same time, it requires no regulation of flow and is very suitable for papers of low capacity (Whatman No. 1, 2 and 4; Ederol 202, Schleicher & Schüll 2043b). The solvent flow is regulated merely by the centrifugal force and the sorption capacity of the paper.

* For Part III, see Z. DEYL AND J. ROSMUS, *J. Chromatog.*, 8 (1962) 537.

** Director: Ing. FRANTIŠEK VONEŠ.

The mobile phase distributor consists of a polyamide or, preferably, of a stainless-steel hollow cylinder, the base of which is provided with 50 holes 0.2 mm in diameter. The cavity of the cylinder is filled with suitable porous material, glass wool being recommended (Fig. 1). Chromatographic paper, with a circle of the same diameter as the outer dimension of the distributor cut out from the center, is fixed by means of a

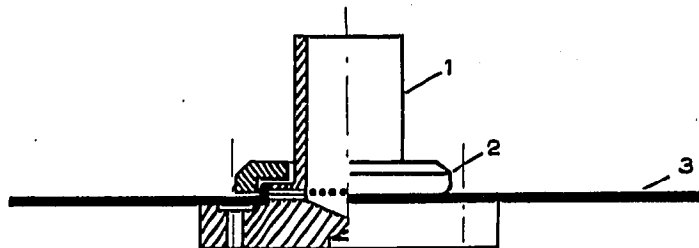


Fig. 2. Chromatographic paper - fixation technique. 1 = hollow cylinder; 2 = fastening ring; 3 = chromatographic paper.

fastening ring. The inner side of the latter is recessed to conform with the recessing of the base of the distributor. By pressing the ring the chromatographic paper starts to swell up until it tightly covers the apertures of the distributor (Fig. 2). The whole distributor unit is firmly coupled with both the motor axle and the three arms, which clasp the paper at its edge (Fig. 3).

When changing the mobile phase the wool must be removed from the distributor with forceps, the distributor rinsed with a suitable solvent (ethanol) and the chromato-

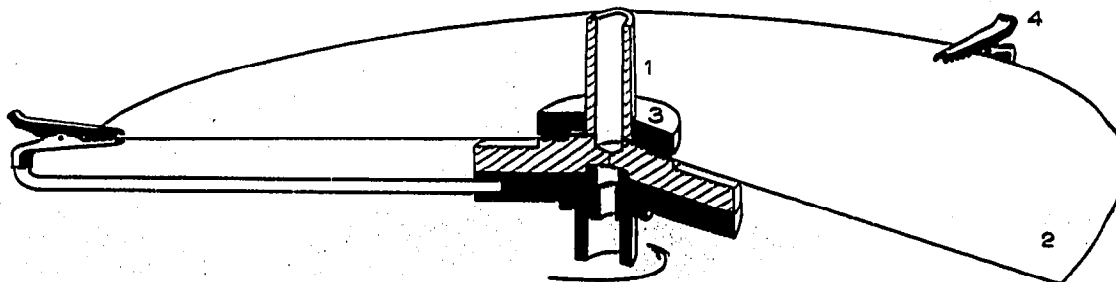


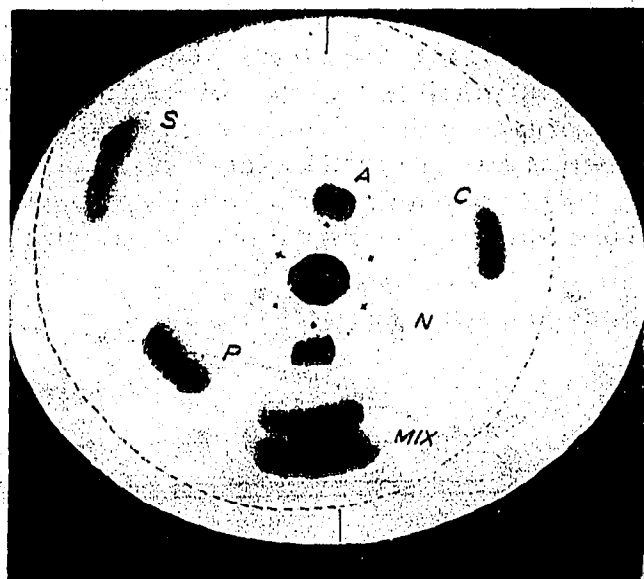
Fig. 3. Arrangement of the apparatus. 1 = distributor; 2 = chromatographic paper; 3 = fastening ring; 4 = crocodile clips.

graph left for 2 min. Then the distributor is filled with new material, chromatographic paper inserted, and the mobile phase pipetted onto the bottom of the chromatographic chamber. The chromatograph is then run for another 2 min to permit saturation of the chamber. Finally the mobile phase is pipetted into the distributor to be developed as usual.

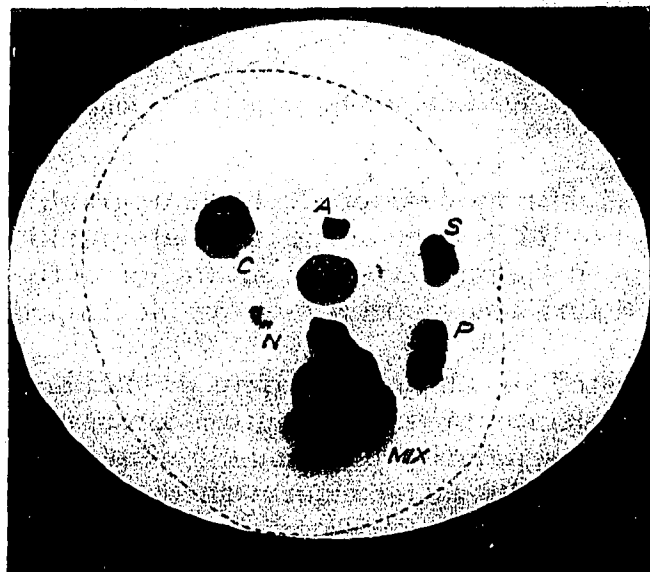
The properties of this distributor were tested by chromatography of standard Schleicher & Schüll dyes using 2% sodium citrate in 2.5% aqueous ammonia. Fig. 4 shows the differences between the results of separation on using different types of chromatographic paper. The separation is generally faster than with the central spot distributor described by PAVLIČEK *et al.*⁵ but slower than with McDONALD'S apparatus. The quality of separation, however, was found to be just the reverse. With the above described distributor it is approximately the same or a little worse



A



B



C

Fig. 4. Comparison of different chromatographic papers, using standard dyes of Schleicher & Schüll for testing chromatographic papers. A = Whatman No. 1; B = Whatman No. 3; C = Ederol 225.

than with the central-ball distributor, but much better than with McDONALD's excentric distributor.

For a comparison of the separation time for different types of chromatographic papers see Table I.

TABLE I

DEVELOPING TIME FOR VARIOUS KINDS OF CHROMATOGRAPHIC PAPERS
750 r.p.m., 2 % sodium citrate in 2.5 % aqueous ammonia, diameter of the chromatogram 25 cm

<i>Kind of paper</i>	<i>Developing time (min)</i>	<i>Quality of separation</i>
Whatman No. 1	20	good
Whatman No. 2	18	good
Whatman No. 3	15	good
Whatman No. 4	12	good
Ederol 202	18	good
Ederol 225	10	sufficient
Schleicher & Schüll 2043 b	20	excellent

ACKNOWLEDGEMENT

Thanks are due to Messrs. Schleicher & Schüll for kindly providing some samples of standard dyes.

SUMMARY

In this paper a simple distributor of the mobile phase for centrifugal paper chromatography is described. This distributor has some advantages over other systems described previously, *viz.* the more rapid and simple manner in which the mobile phase is fed from the reservoir. Since this device enables the mobile phase to be changed rapidly, it can be used for such types of chromatography where this is necessary, as well as for gradient elution paper chromatography.

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- ⁶ J. R. TATA AND A. W. HEMMINGS, *J. Chromatog.*, 3 (1960) 225.

J. Chromatog., 9 (1962) 92-95