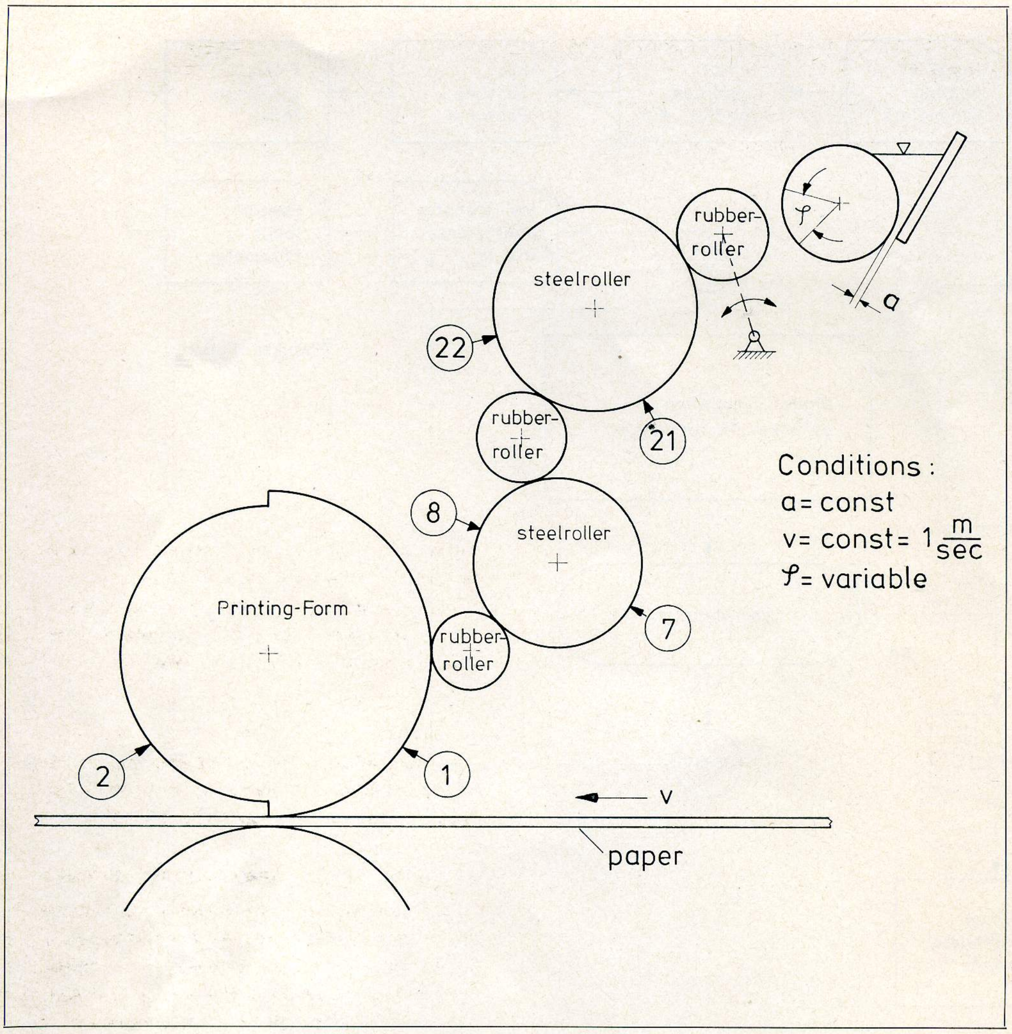
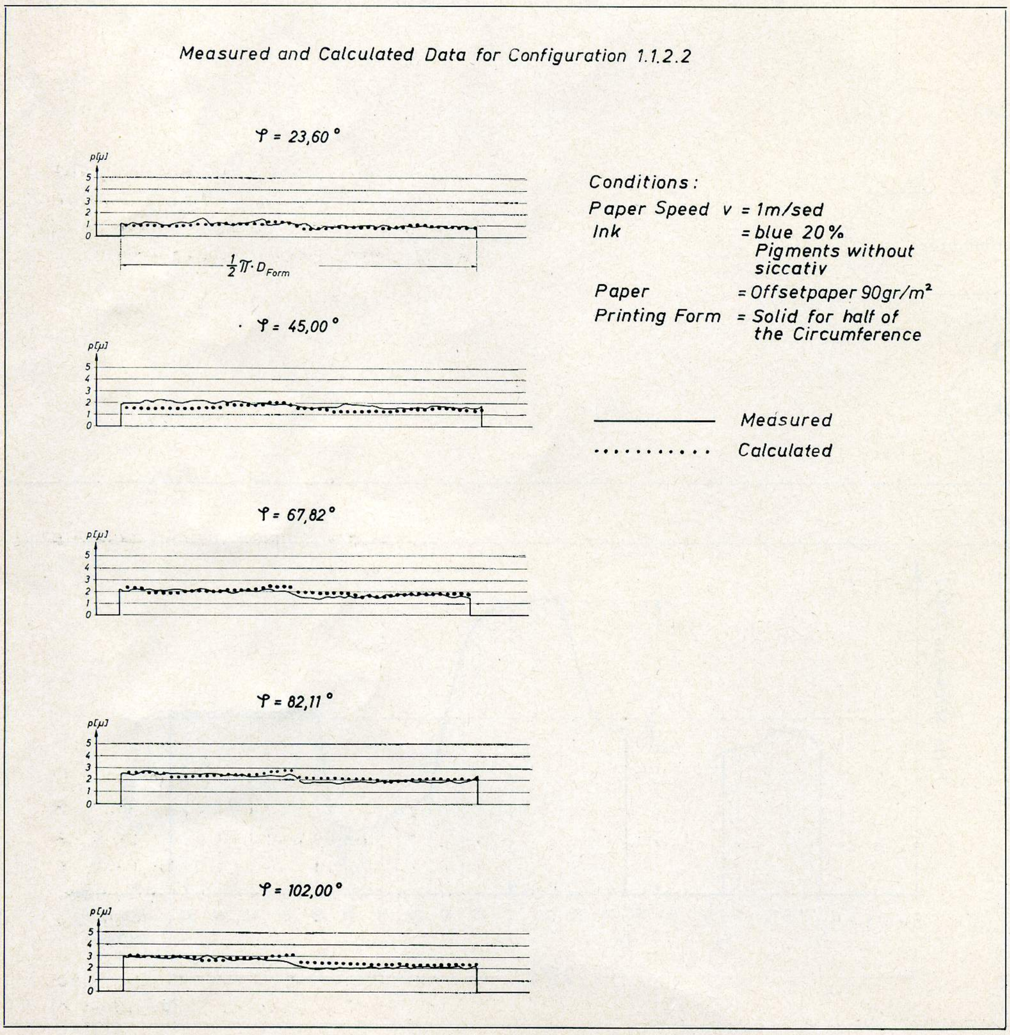


6

7



sumed for each roller. Subsequently, a number of calculations are carried out until a steady state condition has been reached, which is shown by the fact that the film thickness profile does not change any longer. To simplify the computation according to this theoretical model, the following restrictive assumptions are made:

1. The complete inking unit works without slippage.
2. Possible effects of oscillating roller motions are not taken into consideration.

For the explanation of the theoretical model it is necessary, first of all, to examine the basic model of two rollers rolling on each other (fig. 3). The circumference of the two rollers are subdivided into small segments. The selected segment length is the same for both rollers when rolling. The number of the segments on each roller must be integral. For this purpose, the final integer (number of segments) must be obtained by rounding off to the nearest whole number. Before entering the contact zone in the nip, roller I has a film thickness of SI (iI) and roller II a film thickness of SII (iII). The sum of the two film thicknesses is:

$$sI, II = sI\,(iI)_{jI} + sII\,(iII)_{jII} \qquad [1]$$

If we assume that the two rollers contact each other in discrete small segments (contact zone) the ink film thickness after splitting can be defined as: sI′ (iI) and sII′ (iII)

Each film thickness is identified by two indices: index i indicates the specific position on the roller circumference. Index j indicates the number of roller revolutions. Whereas index i varies from I to i_{D1}, index j remains constant in any one revolution and increases by I for each revolution. The factor a in the following system of equations is the ink splitting coefficient. For the simple case of the two-roller system, in which no ink is fed and from which no ink is removed, the following system of equations can be derived:

$$sI'\,(iI)_{jI} = \alpha \cdot sI, II \qquad [2]$$
$$sII'\,(iII)_{jII} = (1-\alpha) \cdot sI, II = sI, II - sI\,(iI)_{jI}$$

Thus, the film thickness profile of rollers I and II leaving the zone of contact can be determined in a discrete form.

With the help of these discrete film thickness values, for example sI(iI), an approximation of the profile can then be drawn as an envelope. The smaller the segments the