respectively. The two automatic spray guns were set up at the entrance of the booth on either side of the conveyer line and were so placed that the axis of the spray was directed at an acute angle of about 10° to the conveyer line. The velocity of air in the middle of the booth was regulated to be 0.8—3.0 m per sec..

The following table shows the results of an experiment, in which the small basin 20 cm in diameter and 5 cm in depth were used. The electrostatic voltage applied between the basin and the negative electrode was 36 K. V..

Uniformity of the application
(Application weight ; gr. per dm^2.)

	Inside surface	Outside surface
Side wall :		
upper	1.0	1.7
middle	1.6	1.6
〃	1.6	1.9
lower	2.2	1.1
Bottom wall	1.6	1.6
Total	7.2	7.2

These figures indicate that the uniformity of thickness could be improved appreciably by rotating the specimens when they pass through the electrostatic field and moreover the efficiency was almost doubled compared with the ordinary automatic spraying methods, the application of which are, at present, confined only to the panels.

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12. Study on High Dielectric Constant Ceramics. (X) BaToiO$_3$ Ceramics as the Electrostrictive Vibrator

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There are four modes of vibration in $BaTiO_3$ ceramics which can be excited by an electrostrictive effect, namely a longitudinal mode at right angles to the applied field, a radial mode of a circuler plate at right angles to the applied field, a thickness longitudinal mode and a thickness shear mode. The last one is excited when the A.C. field is at right angles to the D.C. polarization. The amount of motion is larger than in magnetostrictive materials, and $BaTiO_3$ seems to be one of the most important electromechanical transducing element.

As is well known from the theory of electro-acoustic transformation, equivalent mass constant m, stiffness constant s and mechanical resistance r of a electrostrictive vibrator can be represented in terms of the electrical constants L', C' and R' respectively in the ordinary equivalent electric circuit as follows.

$$\left.\begin{aligned} L' &= m/A^2 \\ 1/C' &= s/A^2 \\ R' &= r/A^2 \end{aligned}\right\} \qquad (1)$$

where A is the transformation constant generally called the force factor, which is proportional to the electrostrictive constant λ. Then, if we measure the electrical impedance of the vibrator, we are able to calculate the numerical values of m, s, r and A (if we know one of these constants) according to the following relations.

$$\left.\begin{aligned} &|\dot{Y}_{mo}| = 1/R' \\ &\dot{Y}_d = \omega_r\ C_d = 2\pi\ f_r\ C_d \\ &\omega^2{}_r = (2\pi\ f_r)^2 = \frac{1}{L'}\left(\frac{1}{C'} - \frac{1}{C_d}\right) \\ &\Delta = \pi \cdot \Delta f = \frac{R'}{2L'} \end{aligned}\right\} \qquad (2)$$

where Y_{mo} is motional admittance, Y_d is damped admittance, f_r is resonant frequency and Δ is so called damping constant.

Impedance measurements were carried out about many samples in the D.C. biasing field or previously treated in the D.C. field. The mechanical constants or material constants of $BaTiO_3$ ceramic vibrators were deduced by the method above mentioned, and it was confirmed that $BaTiO_3$ has excellent electromechanical transducing properties.

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13. Study on High Dielectric Constant Ceramics. (XI) Electrostrictive Vibrations of Rectangular $BaTiO_3$ Ceramic Plate

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In the previous report (K. Abe and T. Tanaka: This issue. 20 (1050), 55.), we treated the longitudinal length mode of vibration which can be excited in the long thin bar of $BaTiO_3$ ceramics. In rectangular plate, two kinds of vibration, except thickness mode, can be excited, one of which is that of length direction (longer side direction) and the other is breadth direction (shorter side direction). In the course of experiments, it was found that the frequency constants and intensity of these two vibrations differed considerably, and these were always high in the vibration of shorter side compared with those of longer side. Table 1 shows the results of preliminary tests of frequency constants about several samples.