APPENDIX IV

STRAIN MEASUREMENTS

A grid of 1/2-in.-diameter circles on 3/8 in. centers covering an area of 64 square in. was applied by an electrolytic etch technique to selected sheets for two of the parts, the blower housing and the instrument panel.

After drawing the part, the grid was measured to determine the strain along a traverse of the grid circles which included the maximum stretch area and aligned with the maximum stretch direction, as determined by the elliptical shape of the deformed circles. The maximum strain and the principal strain at a right angle to it were measured for each ellipse in the traverse. Average results for all parts measured are recorded in Table 10.

The strain pattern for the blower housing changed very little in parts drawn from the four materials. Instrument panel measurements show an increase in maximum strain in the low n and low r material, as compared with the other three materials which were similar. The average strains for all materials used for each part are plotted in Fig. 13.

The area increase in the circle of maximum strain was calculated (see Table 10). Although the area increase for the blower housing and instrument panel were similar (50 to 60 per cent) the distortion of metal to obtain this increase was not. The blower housing had a maximum stretch of 140 per cent (in the rolling direction of the coil) accompanied by a contraction of 35 per cent (in the transverse to rolling direction). The instrument panel had a stretch of 40 per cent (in the rolling direction) accompanied by a stretch of 15 per cent (in the transverse to rolling direction). These strain patterns are indicative of severe deep drawing and biaxial stretching, respectively.

It became evident in analyzing these grid patterns that a smaller circle pattern, possibly 0.20 or 0.25 in. diameter, would have permitted more accurate determinations of the maximum strains and strain positions.