## PUNCH ASSEMBLY

A. INSTALLATION OF RING C INTO A AND B (Figure A-1)

During the assembly of A-B, no appreciable stresses are induced since a very small force, if any, is required during its installation. (Ref. Figure A-10.)

Interference between Ring C and Ring A-B assembly is 0.008 inch on the radius. Its contact pressure is given by

$$p = \frac{E \delta}{b} \frac{(b^2 - a^2) (c^2 - b^2)}{(2b^2) (c^2 - a^2)}$$

$$= \frac{29 \times 10^{6} \times 0.008 (\overline{2.15}^{2} - \overline{1.40}^{2}) (\overline{3.50}^{2} - \overline{2.15}^{2})}{2.15 (2) (\overline{2.15})^{2} (\overline{3.50}^{2} - \overline{1.40})^{2}}$$

= 23,000 psi

## 1. Stresses

At o.d. of Ring A:

$$f_{t} = \frac{b^{2} p}{c^{2} - b^{2}} \left(1 + \frac{c^{2}}{r^{2}}\right) = \frac{\overline{2.15}^{2}(23,000)}{\overline{3.50}^{2} - \overline{2.15}^{2}} \left(1 + \frac{\overline{3.50}^{2}}{\overline{3.50}^{2}}\right)$$

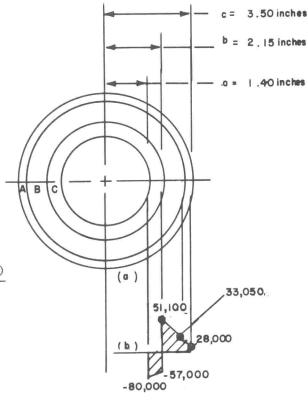
= 14,000 (2) = 28,000 psi

At A-B Interface:

$$f_t = 14,000 \left(1 + \frac{\overline{3.50^2}}{\overline{3.00^2}}\right) = 33,050 \text{ psi}$$

At B-C Interface:

$$f_t = 14,000 \left(1 + \frac{\overline{3.50}^2}{2.15^2}\right) = 51,100 \text{ psi}$$



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Figure A-1 STRESS DISTRIBUTION DURING INSTALLATION OF RING C INTO A AND B

$$f_c = \frac{b^2 p}{(b^2 - a^2)} \left( 1 + \frac{a^2}{r^2} \right) = \frac{2.15^2 (23,000)}{(2.15^2 - 1.40^2)} \left( 1 + \frac{1.40^2}{2.15^2} \right)$$

= 57,000 psi

At i. d. of Ring C:

$$f_c = 40,000 \left( 1 + \frac{1.40^2}{1.40^2} \right)$$

= 80,000 psi

These stresses are plotted as shown in Figure A-1(b).

## 2. Strain Gage Data

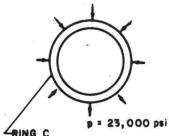
From Table A-I an average reading of 30, 300 psi was recorded. (Readings indicate that strain gage No. 4 yielded higher values than the other three gages and showed up especially when Ring D was installed. Therefore, it was not included in the average value.) A 7.6 percent difference existed between the calculated (28,000 psi) and test (30,300 psi) values. It was concluded that these values are close enough for our intents and purposes.

## 3. Radial Displacement of i.d. Of Ring C Due To Ring C Installation (Figure A-2

$$\delta = \frac{2 (b^2 p)(a)}{E (b^2 - a^2)} = \frac{2}{29 \times 10^6} \frac{(2.15^2 \times 23,000) (1.40)}{(2.15^2 - 1.40^2)}$$

= 0.0038 inch

This deflection is added to the existing interference (before assembly) of Ring D.



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Figure A-2 RADIAL DISPLACEMENT OF i.d. OF RING C DUE TO RING C INSTALLATION