



FIGURE 76. DESIGN STRESS PATTERN IN CONTAINER III AT ROOM TEMPERATURE

electrode vacuum-melting practices, used for constructing the container are given in Table LIV. A thorough ultrasonic inspection of each ring revealed no measurable defects.

TABLE LIV. COMPOSITION, HEAT TREATMENT, AND HARDNESSES OF THE COMPONENTS USED FOR THE FOUR-RING ASSEMBLY OF CONTAINER III

<u>AISI-H11, Nominal Composition, percent - (All rings)</u>		
0.41 Carbon	5.1 Chromium	1.23 Molybdenum
0.5 Vanadium	0.27 Manganese	1.0 Silicon
<u>Heat Treatment</u>		
Austenitize	1850 F for 1-1/2 hr	All rings
Quench	Air cool	
Temper, liner	950 for 2 hr	<u>Hardness</u> - R _C 54/56
	1000 for 2 hr	
	1000 for 2 hr	
Temper, outer three rings	1090 for 4 hr	<u>Hardness</u> - R _C 44/46
	1100 for 4 hr	
	1110 for 4 hr	

Because the whole container unit was made from the same material, the coefficient of thermal expansion in each ring under temperature was the same. (It was not expected that differences in hardness levels of the rings would markedly affect the coefficient of thermal expansion.) Therefore, the stress distribution pattern for the rings at 500 F would be the same as those shown in Figure 76b. However, the pressure capability at 500 F is limited to 225,000 psi by the effect of temperature on strength. Therefore, the interface stresses predicted in Figure 76b would be less proportionately to the bore stresses, in service at 500 F. The same pressure limit, 225,000 psi at 500 F was also imposed on Containers I and II.

It is pertinent at this stage to compare the residual stress patterns in Container II, Figure 74a, with those predicted for Container III. It is seen that the design hoop prestress of 268,000 psi in the H-11 liner of Container III is about 3 percent higher than that for the harder AISI-M50 liner in Container II. In view of the lack of knowledge of the fatigue properties of AISI-M50 it is not possible to determine what the predicted fatigue life of Container II would be. However, rotating-beam fatigue data obtained on a similar type of material AISI M2 at a hardness of R_C 62, suggests that the fatigue limit at 10⁶ cycles for AISI-M50 might be about 140,000 psi whereas for AISI H11 the corresponding figure is 150,000 psi. (49)

Container Assembly

The four rings, which were slightly tapered for press fitting, were assembled by a hydraulic press from the outer ring inwards. A lubricant was applied to the interfaces of the rings to ease assembly. The calculated press loads required for assembly