I. STRESS ANALYSIS

The discussion of a stress analysis involving the compression of wafers in an opposed-anvil apparatus necessitates an agreement on the terminology to be employed. The wafer is initially in the form of a short, right circular cylinder, and is located between an identical pair of parallel plates, called anvils. As these anvils are brought closer together, a compressive force is generated on, and in a direction perpendicular to the parallel surfaces of the wafer. This loading causes the wafer to expand in the radial direction; however, the original cylindrical shape of the wafer is not necessarily maintained. The expanding wafer is retarded at the wafer-anvil interfaces by the inherent shearing action, and consquently deforms into a barrel shape (barrelling). If the compression plates are non-rigid, then they too will undergo a certain deformation pattern with change in load. The assumed elastic behavior of the anvils requires that they return to their initial parallel position upon unloading. However, the wafer is allowed to flow plastically and will, in general, be permanently distorted. Figure 1 is a qualitative view of the wafer in the deformed state. If the wafer maintains its cylindrical shape during expansion, then the single radial coordinate r can be used to describe the process. The posession of axial symmetry eliminates the variation of any parameters with the circumferential coordinate θ. In