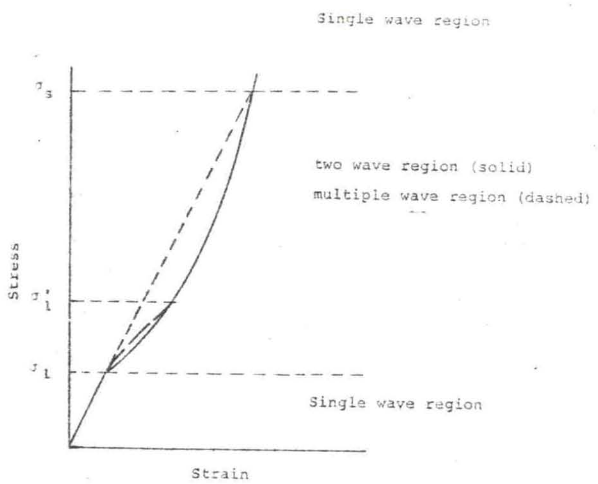

FIG. 3. Schematic diagram of possible response curves for shock compression.

In Ref. 8 conditions were discussed in which more than one shock wave are generated. Two shock waves are expected to be generated in a material which is shock compressed to a stress slightly above its dynamic elastic limit or phase transition pressure. In such cases the stress and strain behind the second wave are

$$\sigma_2=[\rho_0U_{s1}(U_{s2}-U_{p1})(U_{p2}-U_{p1})/(U_{s1}-U_{p1})]+\sigma_1, \tag{3}$$

and

$$\epsilon_2=1-[(U_{s1}-U_{p1})(U_{s2}-U_{p2})/U_{s1}(U_{s2}-U_{p1})], \tag{4}$$

where U_{s1} and U_{s2} are the velocities in laboratory coordinates of the first and second shock waves, and U_{p1} and U_{p2} are the material velocities behind the first and second waves. The regions in which these equations are applicable are shown in the Hugoniot diagram of Fig. 3. The Hugoniot shown in Fig. 3 corresponds to a material with a yield point or phase transition at σ_1. If the transition or yielding does not occur at a well specified stress but occurs over a range of stresses (σ_1 to σ_1' in Fig. 3) a shock wave fan will be generated for stresses between σ_1 and σ_s. For this case Eqs. (3) and (4) may be generalized to n shock waves. Thus,

$$\sigma_n=\sigma_{n-1}+[\rho_0(U_{sn}-U_{p,n-1})(U_{pn}-U_{p,n-1})/(1-\epsilon_{n-1})] \tag{5}$$

and

$$\epsilon_n=1-\prod_{i=1}^{i=n}[(U_{si}-U_{pi})/(U_{si}-U_{p,i-1})]. \tag{6}$$

For the wedge configuration used in this series of experiments, it is possible to determine the general features of the Hugoniot by analysis of the shape of the free surface. Thus in Fig. 2, it is seen that the free surface has two points of slope change which correspond to the intersection of two waves with the free surface. The analysis of these data are based on the two wave configuration shown in Fig. 4. For such a two-wave system, the first wave is the elastic wave and transmits a stress corresponding to the dynamic elastic limit or yield point. Upon its reflection at the free surface, two waves reflect into the sample, a dilatational and a shear wave. Because the second wave or plastic wave is well above the yield point, shear forces are not considered so that only a single longitudinal decompression wave is considered

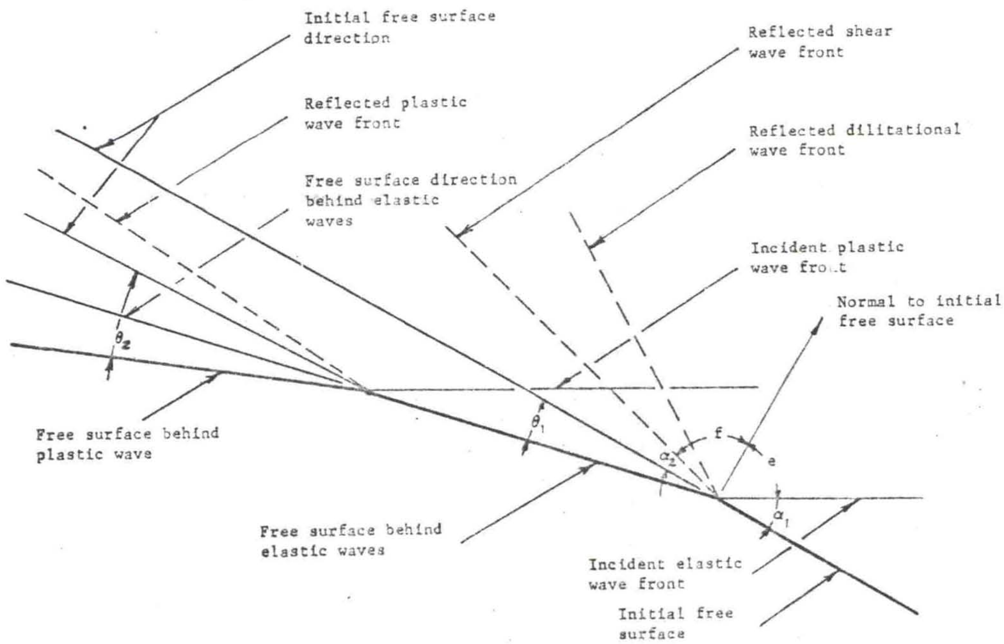

FIG. 4. Free surface and shock wave configuration.