Integrating both sides over E' gives an implicit relation for $\int dE'\langle 1,$ which yields

$$\int dE'\langle 1, E'|\psi_E{}^1\rangle = [1+\pi^2|V_{12}|^2]^{-1}.$$

Therefore, from (5 *a*, *b*) there is obtained for the amplitudes :

$$\langle 1, E'|\psi_E{}^1\rangle = \frac{\delta(E-E')}{1+\pi^2|V_{12}|^2} - \frac{i\pi|V_{12}|^2}{1+\pi^2|V_{12}|^2}\left(\frac{P}{E-E'}\right),$$

$$\langle 2, E'|\psi_E{}^1\rangle = \frac{V_{12}{}^*}{1+\pi^2|V_{12}|^2}\left\{\frac{P}{E-E'} - i\pi\delta(E-E')\right\},$$

where $P/(E-E')$ is the principal part distribution.

Permuting the continua 1 and 2 leads immediately to the amplitudes

Stage (ii). We consider now how the discrete state is coupled to new continua. We have, for instance, after some rearrangement :

$$\langle a|H|\psi_E{}^1\rangle = \frac{V_1 - i\pi V_{12}{}^* V_2}{1+\pi^2|V_{12}|^2} + \frac{V_{12}{}^*(V_2 - i\pi V_{12}V_1)}{1+\pi^2|V_{12}|^2}\int dE'\,\frac{P}{E-E'}.$$

This is the coupling depicted as $\tilde{V}_{1E}$ in figure 1 (b). Coupling $\tilde{V}_{2E}$ is through a permutation of labels 1 and 2. By Fano's formulae [3] the and the shift are given by

$$\Gamma(E) = \pi^2\{|\tilde{V}_{1E}|^2 + |\tilde{V}_{2E}|^2\},$$

$$\Delta(E) = \int dE''\{|\tilde{V}_{1E''}|^2 + |\tilde{V}_{2E''}|^2\}\frac{P}{E-E''}.$$

It is important, as will now be shown, to keep in formula (9) the $\int dE'(P/E-E')$ which makes $\tilde{V}_{1E}$ E-dependent (the same holding f At first view it might seem that this integral could be replaced by which case we would have E-independent couplings with two conti application of (10) the damping would be that given by equation (3) shift would be zero. In the derivation of formula (2) the principal part such as that found in (9), are also present. However, they are all disc