In order that the currents on the $\lambda/2$ dipoles be in phase quadrature, the dipoles may be connected to separate nonresonant lines of unequal length. Suppose, for example, that the terminal impedance of each dipole in a single-bay turnstile antenna is $70 + j0\ \Omega$. Then by connecting 70-$\Omega$ lines (dual coaxial type), as in the schematic diagram of Fig. 16-16*a*, with the length of one line 90 electrical degrees longer than the other, the dipoles will be driven with currents of equal magnitude and in phase quadrature. By connecting a 35-$\Omega$ line between the junction point $P$ of the two 70-$\Omega$ lines and the transmitter, the entire transmission-line system is matched.

Another method of obtaining quadrature currents is by introducing reactance in series with one of the dipoles.[1] Suppose, for example, that the length and diameter of the dipoles in Fig. 16-16*b* result in a terminal impedance of $70 - j70\ \Omega$. By introducing a series reactance (inductive) of $+j70\ \Omega$ at each ter-

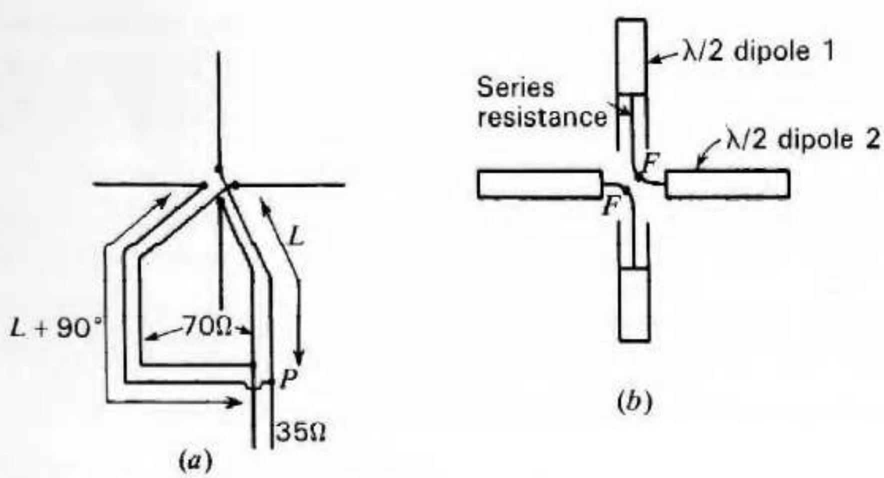


**Figure 16-16** Arrangements for feeding turnstile antennas.

[1] G. H. Brown and J. Epstein, "A Pretuned Turnstile Antenna," *Electronics*, **18**, 102–107, June 1945.

minal of dipole 1 as in Fig. 16-16$b$, the terminal impedance of this dipole becomes $70 + j70\ \Omega$. With the 2 dipoles connected in parallel, the currents are

$$I_1 = \frac{V}{70 + j70}$$

and

$$I_2 = \frac{V}{70 - j70} \tag{6}$$

where $V$ = impressed emf

$I_1$ = current at terminals of dipole 1

$I_2$ = current at terminals of dipole 2

Thus,

$$I_1 = \frac{V}{99} \angle -45^\circ$$

and

$$I_2 = \frac{V}{99} \angle +45^\circ \tag{7}$$

so that $I_1$ and $I_2$ are equal in magnitude but $I_2$ leads $I_1$ by 90°. The 2 impedances in parallel yield

$$Z = \frac{1}{Y} = \frac{1}{[1/(70 + j70)] + [1/(70 - j70)]} = 70 + j0 \qquad (\Omega) \tag{8}$$

so that a 70-$\Omega$ (dual coaxial) line will be properly matched when connected to the terminals $FF$.