C. *Compound Horn Loudspeaker*.[32]—The compound horn loudspeaker consists of a single diaphragm mechanism with one side of the diaphragm coupled to a straight axis horn and the other side coupled to a long folded horn, Fig. 7.22. The equivalent of the system is shown in Fig. 7.22. The functional acoustical network of the vibrating system is also shown in Fig. 7.22. At the low frequencies the acoustical reactance of the acoustical capacitance, C_{A2}, is large compared to the throat acoustical impedance, z_{A2}, of the low-frequency horn and sound radiation issues from the low-frequency horn. At the high frequencies the acoustical reactance of the acoustical capacitance, C_{A2}, is small compared to the acoustical impedances, z_{A1} and z_{A2}, and, therefore, shuts out the low-frequency horn and radiation issues from the high-frequency horn. In the mid-range, radiation issues from both horns. The response frequency characteristic, Fig. 7.22, shows the response range of the two horns. The throats of the two horns may be chosen so that the efficiency characteristic of this loudspeaker will be the same as that of the two-channel system discussed in the preceding section. However, the power handling capacity is somewhat smaller because the size of the diaphragm must be a compromise between high-and low-frequency requirements.

[32] Olson and Massa, *Jour. Acous. Soc. Amer.*, Vol. 8, No. 1, p. 48, 1936.

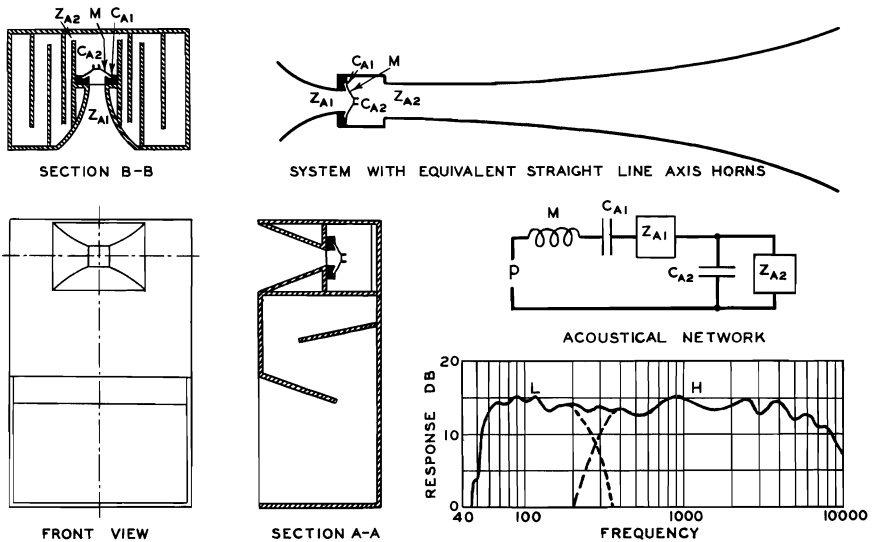

FIG. 7.22. Cross-sectional view of a compound horn loudspeaker, the developed equivalent of the high- and low-frequency horns, and the acoustical network of the acoustical system. In the acoustical network: M = the inertance of the diaphragm. C_{A1} = the acoustical capacitance of the diaphragm suspension system. z_{A1} = the acoustical impedance at the throat of the small horn. z_{A2} = the acoustical impedance at the throat of the large horn. C_{A2} = the acoustical capacitance of the chamber behind the diaphragm. P = the driving pressure. $p = Bli/A$. B = the flux density. l = the length of the conductor in the voice coil. i = the current in the voice coil. A = the area of the diaphragm. The sections A-A and B-B refer to the horizontal and vertical cross sections of the front view. The graph shows the frequency ranges of the high-frequency and low-frequency horns and the over-all pressure response frequency characteristic.