

Boundary Microphone. Long and Wickersham have patented¹⁴ what they call the *pressure-recording process* and a device that positions a conventional microphone very close to a plane surface such as a floor. This has given rise to a number of products which basically function as shown in Fig. 6.9. A miniature electret microphone is spaced about 0.04 in (1 mm) from a large reflecting plane. A conventional microphone, which is situated above the floor, receives the direct sound wave plus a reflected wave from the floor. It suffers from dips in frequency response, at the frequency where the spacing is one-quarter wavelength, and its harmonics, as the reflected sound wave interferes with the direct sound wave. When the spacing is reduced to about 0.04 in (1 mm), the null frequency moves far above the audible range. Therefore, in actual use the boundary microphone does not suffer from the *comb-filter series* of dips in frequency response. The sys-

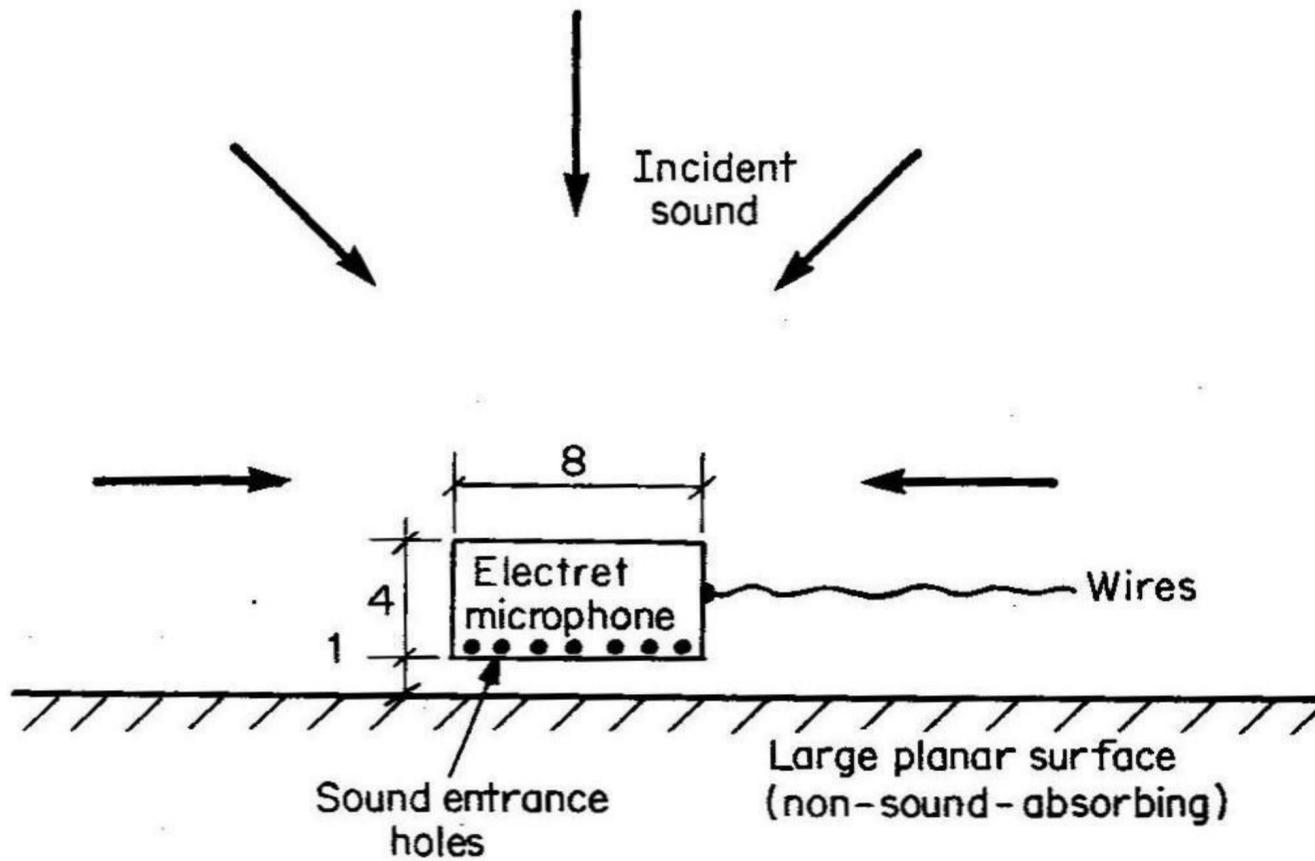


FIG. 6.9 Boundary-microphone principle. Dimensions are in millimeters.

tem has, in essence, a directional gain of 6 dB due to pressure doubling at the reflecting plane; for example, the reflected wave is in phase and adds to the amplitude of the direct wave. This results in a hemispheric pickup pattern where the 90° response (direction parallel to the plane) is 6 dB down with respect to the 0° or perpendicular incidence response. Complete test data are reported in Sank.¹⁵

A suitable transducer for the boundary microphone of Fig. 6.9 is the sub-miniature electret microphone developed by Killion and Carlson.⁵ It incorporates an integral solid-state preamplifier. It is ideal for a floor-mounted microphone because it has extremely low vibration sensitivity. This type of microphone element is molded into a plastic housing which is fastened to a small metal plate in the commercial product described in Ref. 15. To obtain the measured acoustical performance, the small plate must, of course, be placed on a much larger plane surface.

In many applications it is desirable for a boundary microphone to be more directional. For instance, the rear portion of the hemispherical pattern may pick up audience noise when the microphone is mounted on a stage floor. Bullock and Woodard¹⁶ have described a directional boundary microphone in which an electret element with a cardioid directivity is mounted close to a surface, with the principal pickup axis parallel to the surface.