A Distributed-Source Horn

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Constructional data for a high-frequency horn which is particularly well suited for home building by the audio enthusiast.

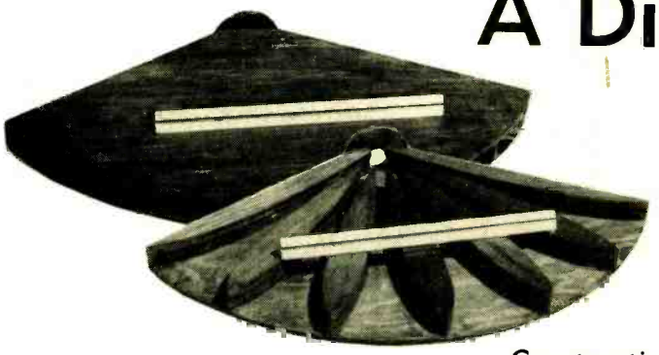

Fig. 1 (above). Sound appears to originate from the entire area of the horn rather than from the throat as in a conventional horn. Fig. 2. With the top removed, the simplicity of construction is apparent.

ONE OBVIOUS DIFFERENCE between reproduced music and the original is the difference in spatial distribution of the sound. This difficulty can only be eliminated through the medium of a binaural system, which is not economically feasible at this time. Thus, until now we have been restricted to point-source reproductions. The sound emerging from a distributed source horn (DSH) appears to originate from an area rather than a point and is thus a step closer to the desired spatial distribution than conventional multicellular horns. In addition, the DSH described here provides much broader directivity patterns, is much more easily constructed, and takes up less space than the multicellular type.

The explanation of the apparent distributed source is evident from the field plot shown in *Fig.* 3. In the vertical plane the lines of flow do not diverge until they reach the mouth of the horn, thus to an observer a few feet from the horn they appear to be originating at the mouth of each cell of the horn. Of course, in the horizontal plane the lines of flow diverge at the throat of the horn and so in this plane the apparent source is at this point. Thus, there are seven apparent sources of sound in the DSH described here. The sources tend to blend together and give the impression of the sound originating from the area of the horn rather than at each point.

The broad directivity pattern in the vertical plane is a result of the fact that the vertical dimension of the mouth is small compared to wavelength through most of the frequency range of interest. In the horizontal plane the directivity pattern is broad because a large portion of a circular wave is generated. The directivity characteristic of the DSH is shown by the solid line in *Fig.* 4. The broken line represents the characteristic of a standard eight-cell multicellular horn.

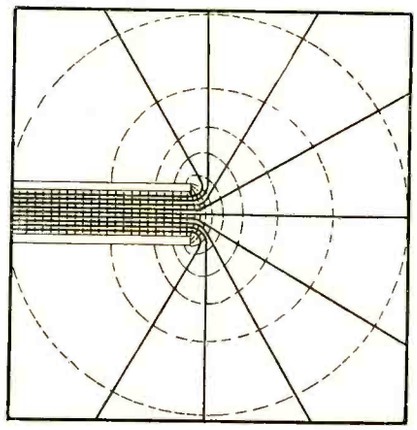

Fig. 3. The apparent source of sound in the vertical plane is just slightly in front of the mouth of each cell, as indicated by the lines of flow (solid lines). In the horizontal plane the source is near the throat.

Figure 5 shows the dimensions of the DSH tested. It has sufficient mouth area to prevent reflection for frequencies greater than 750 cps. The expansion is approximately exponential and provides a cut-off frequency of 375 cps. Thus, the mouth area is the limiting factor and the horn should not be used below 750 cps.

Construction

The construction of the DSH is much simpler than that of the multicellular horn. Since there is no vertical expan-

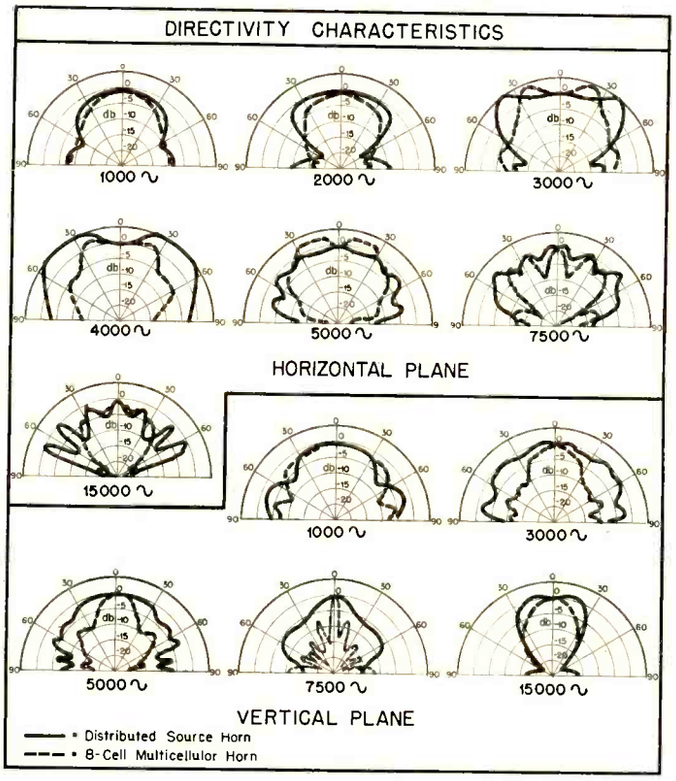

Fig. 4. The directivity patterns of the DSH (solid lines) are considerably broader than those of the conventional 800-cps multicellular horn (dotted lines).

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