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TUBULAR SPEAKER HOUSING

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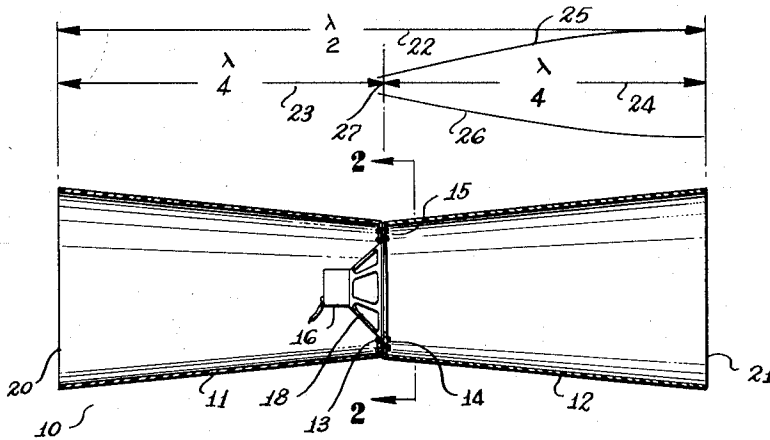


Fig. 1

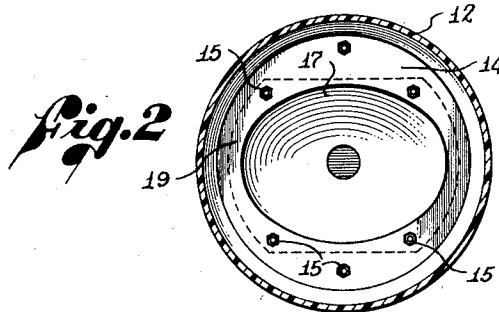


Fig. 2

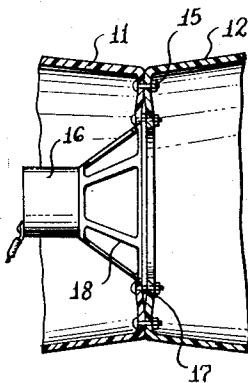


Fig. 3

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TUBULAR SPEAKER HOUSING

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1 Claim. (Cl. 181-27)

This invention relates generally to housings for loudspeakers and more particularly to a tubular speaker housing in which the speaker is mounted in a rigid baffle located at the midpoint of a tubular housing, and sound is radiated from both ends. Preferably, the speaker is an elliptical, conoidal, dynamic speaker radiating back and front from two equal, open-ended, tubular horns of slightly divergent cross-section.

All speaker housings intended for home use represent a number of compromises between conflicting requirements. In the rare cases in which expense is no consideration, and any amount of space required is available, a home might conceivably use a very massive speaker housing, together with three or more separate speakers for different ranges of sound reproduction, such as the acoustic reproduction systems employed in theaters, but as a practical matter, most homes are sufficiently limited by economic and space considerations that very high fidelity of sound must be sacrificed to some degree in order to provide a speaker system which is light enough, small enough in volume, and cheap enough in price to be practical, but which at the same time is capable of achieving the best sound reproduction within such limitations.

In sound reproduction, the high notes are readily reproduced regardless of speaker housing construction, except that they can be lost in a maze of baffling, and should be radiated directly to the listener. The low notes, however, present by far the most serious problem, and are dependent for good reproduction on a housing capable of resonating at some frequency not very much higher than the lowest note which it is desired to reproduce accurately. Most speaker systems attempt to reproduce the base range by means of very large housings, usually with walls made very heavy in order to achieve rigidity, and complex internal baffling which makes necessary an entirely independent housing for the high frequency reproduction. Generally speaking, small, light weight speaker housings make very little attempt to reproduce the low frequency range of sounds with any degree of fidelity.

It is a major object of the present invention to provide a speaker housing capable of reproducing a wide range of sounds with high fidelity through the medium of a single speaker.

It is an associated major object to provide a light weight speaker system capable of emphasizing the reproduction of low frequency notes, but at the same time radiating high frequency sounds without interference from any baffling or folded horn structure.

It is another object to provide a speaker housing system which can be suspended and used to radiate sound equally in opposite directions.

Still another object of the invention is to provide a tubular speaker system capable of resonating at a predetermined principal frequency whose wave length is about the same over all length as the speaker housing.

The foregoing and other objects of the invention are accomplished by means of an elongated, tubular housing with the speaker coaxially mounted in a transverse baffle

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at the midpoint. It will be shown, in connection with the following description of a specific embodiment, that the system radiates high and middle range frequencies with a minimum of interference from the speaker housing, while lower range frequencies, in the range of the principal frequency of the housing, are somewhat amplified acoustically by resonance characteristics of the system.

A specific embodiment of the speaker is described below, and illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal, sectional view through the speaker housing, showing a speaker mounted coaxially at the midpoint;

Figure 2 is a transverse sectional view taken just to the right of the speaker baffle in the direction of the arrows 2-2 in Figure 1; and

Figure 3 is an enlarged fragmentary view of the speaker baffle and speaker, as seen in transverse section.

In Figure 1, a speaker system, indicated generally by the numeral 10, is seen to be comprised principally of two slightly conical tubular members 11 and 12, attached at their bases 13 and 14, respectively, by means of a ring of peripheral bolts 15, best seen in Figure 2.

A speaker 16 is shown mounted in the transverse baffle structure comprised of the adjoining bases 13 and 14 and positioned in an opening 17 with the front of the cone 18 radiating through the right tubular chamber 12 and the back of the cone 18 radiating to the left through chamber 11.

It will be seen that the speaker 16 has a flange 19 which is received between the bases 13 and 14, as best seen in Figure 3, and serves to reinforce the transverse baffle structure, being fastened in position by means of some of the peripheral bolts 15.

Preferably, the speaker 16 is an ellipsoidal, conoidal, dynamic speaker. Such speakers have considerable versatility in simple, one-speaker systems in which it is desired that the speaker respond, as the particular sound may require, to frequencies corresponding to either the shorter or the longer axes of the ellipse. In the present system, radiation is direct from the two open ends 20 and 21 of the left and right tubular members 11 and 12, respectively, and the elliptical speaker, consequently, can be employed to maximum advantage.

Another preferred feature of the specific embodiment illustrated is that the two tubular members 11 and 12 are not perfectly tubular or characteristically conical, as in previously known speaker systems, but are a compromise found practical in association with the type of acoustic resonance described hereinafter. The tubular members are illustrated as frustums of cones with the conical angle of about 10 to 15 degrees, and it has been my experience that the advantages of the characteristic resonance of my speaker system begins to drop off very sharply if 20 degrees conical angle is exceeded.

The resonant characteristics of the system appear to derive from the functioning of the entire speaker system 10 as a resonating tube, open at both ends, and resonating as either a full wave length or half wave length tube, depending on the nature of the excitation of speaker cone 18. For example, resonance of the speaker system 10 has a half wave length tube, with the two halves 11 and 12 functioning as quarter wave length tubes as indicated graphically above the sectional view of the speaker system 10. The dimensional arrow 22 indicates a half wave length overall length for the speaker housing, with the dimensional arrows 23 and 24 indicating equal quarter wave lengths for the tubular members 11 and 12. The curved sinusoidal lines 25 and 26 represent the amplitude of air velocity at various points along tubular member 12, under the conditions of resonance assumed in this example. It will be noted that the two lines 25 and 26

do not come to a perfect node point at the center baffle point at 27; this is because the dynamic speaker cannot be counted upon to behave as a true and perfect velocity node, but only approximately so.

It is important that each of the chambers 11 and 12 have a length which is substantial in comparison with its diameter in order for it to have the resident characteristics of a tube. Preferably, the length of each chamber should be at least twice the diameter of the speaker partition.

It will be understood, of course, that resonance at the principal frequency is not the only form of resonance which the speaker housing can assume. If the highest volume range is nearer to a frequency double the principal frequency, the speaker system may actually function with the speaker cone 18 vibrating as a velocity node, and each of the tubular members 11 and 12 functioning as half wave length tubes. Likewise, higher frequencies may produce different modes of vibration, and still higher frequencies are well radiated without regard to the characteristic resonant features of the housing 10 because the cone 18 radiates directly to the openings 20 and 21.

Although the specific embodiment has been described with special reference to a single speaker system, it will be appreciated that the design could be employed with the more complex system, with the speaker system of the invention assigned to either or both middle and lower ranges, dividing or cross-over networks being used to separate the signals from the amplifier.

Also, while it is preferred that the tubular members 11 and 12 be truly conical, in order to provide maximum rigidity with the lightest and simplest wall structure, it is not impossible to employ the structure of the invention with walls having other than circular transverse sections.

In conclusion, it will be understood that my invention is susceptible of departures of various kinds from the details described in connection with the foregoing specific embodiment, without departing from the spirit and scope of the invention as set forth in the following claim.

I claim:

A speaker system adapted to emphasize a particular frequency, which includes: a pair of substantially identical frusto-conical chamber members, each having a conical divergence not exceeding 20 degrees from a base to an open end, and length equal to about one-quarter the wave length corresponding to said particular frequency; and at least four times the base diameter, said chamber members being attached to each other end to end; an elliptical speaker having a stiff peripheral flange mounted in an opening in the attached bases of said chamber members with the flange of said speaker between said attached bases, said speaker being adapted to radiate sound through both said chamber members to the open ends thereof; and attachment members passing through said bases and said speaker flange to provide a rigid transverse partition.

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