

United States Patent

[11] 3,578,103

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 [21] Appl. No. **830,399**
 [22] Filed **June 4, 1969**
 [45] Patented **May 11, 1971**

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[54] SPEAKER ENCLOSURE
9 Claims, 7 Drawing Figs.

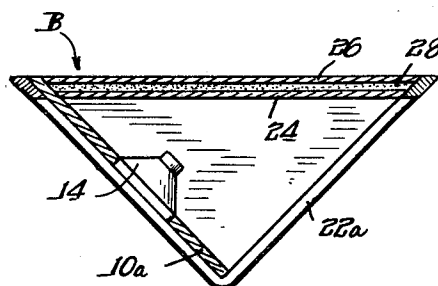
[52] U.S. Cl. 181/31
[51] Int. Cl. G10k 13/00,
H04r 1/28
[50] Field of Search 181/31.1,
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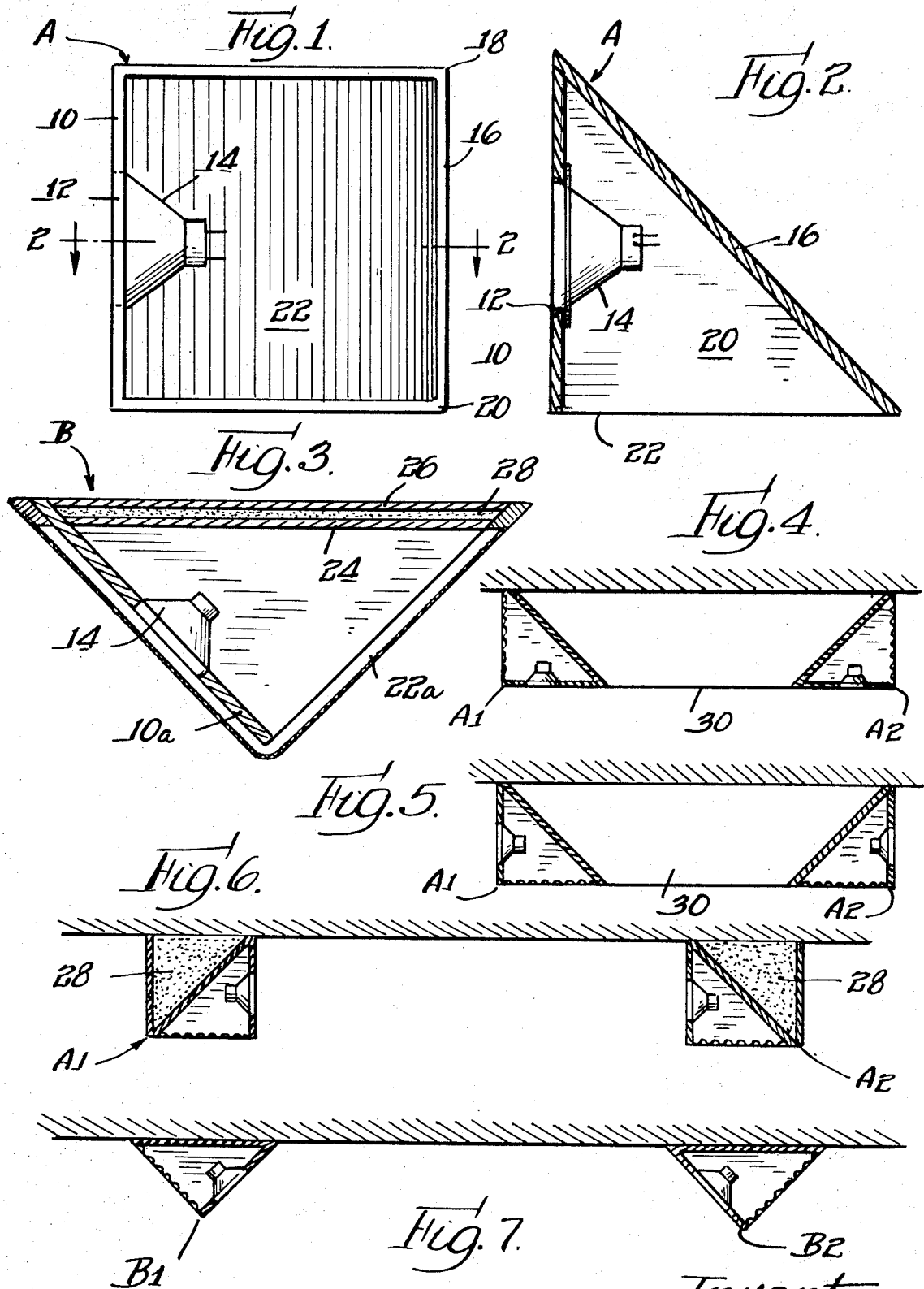
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ABSTRACT: An enclosure for a cone-type loudspeaker and having a mounting wall apertured to receive the speaker with the cone portion extending rearwardly therefrom, and a reflecting wall surface angled rearwardly from one edge of the mounting wall to traverse the space in the rear of the speaker cone and form with the opposite edge of the mounting wall a relatively large opening; the relative angular disposition between the mounting wall and the reflecting wall surface being such that sound vibrations emitted rearwardly from the speaker cone are reflected by the reflecting wall surface to pass freely through the opening in noninterfering relation to the sound vibrations emanating from the front of the speaker, as for example, at about 90° to the axis of the speaker cone.





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SPEAKER ENCLOSURE

The invention is primarily concerned with a loudspeaker enclosure designed to minimize distortion of sound often caused by such an enclosure and to this end, the enclosure is designed to substantially eliminate interference with the free vibration of the speaker cone or diaphragm.

In many loudspeaker enclosures or so-called tone cabinets, the area within such enclosures is in large part captive, and this gives rise to interference caused by reflection of the sound waves from the interior of the enclosure with such reflected waves tending to be out of phase with the natural movement of the speaker cone or diaphragm at least to some extent; and to interference caused by damping the sound waves within the enclosure by the use of sound-absorbing material and in this case, too, there is interference with free motion of the speaker cone or diaphragm; and further by interference caused in reflecting the sound waves through an opening toward a listener in that the pressure waves emanating from the back side of the speaker are 180° out of phase with the pressure waves emanating from the front side of the speaker toward the listener; and in each instance, there is the further difficulty that such enclosures have a natural resonance frequency tending to magnify input frequencies close to the particular resonance frequency, or harmonics thereof, while interfering with or suppressing other frequencies.

The principal object of the present invention is to provide a speaker enclosure which will substantially overcome the above-mentioned difficulties and greatly improve the clarity and fidelity of sound reproduction, and this result is accomplished by reflecting the sound vibrations emanating from the rear side of the speaker at an angle of approximately 90° with respect to the axis of the speaker and allowing these reflected sound vibrations to escape freely through a relatively large and substantially unobstructed opening which also tends to reduce resonance characteristics of the enclosure.

In the accompanying drawings:

FIG. 1 is an elevation of the speaker enclosure looking toward the opening therein;

FIG. 2 is a sectional view taken substantially along the line 2-2 of FIG. 1;

FIG. 3 is a sectional view, similar to that of FIG. 2, but showing a slightly modified form of enclosure with a modified reflecting wall surface;

FIG. 4 is a schematic view showing an arrangement of right- and left-hand speaker enclosures in a console cabinet of a stereo or high-fi assembly;

FIG. 5 is a schematic view similar to FIG. 4, but showing a different orientation of the speaker enclosures;

FIG. 6 is a schematic view showing placement of a pair of speaker enclosures each in a free-standing assembly such as in bookcases or the like; and

FIG. 7 is a schematic view showing a pair of generally triangular speaker enclosures, as in FIG. 3, again as free-standing assemblies such as end tables or the like.

Referring more in detail to the accompanying drawings, and particularly to FIGS. 1 and 2, the enclosure A includes a mounting wall 10 having an aperture 12 therethrough and in which aperture the cone-type speaker 14 is mounted. An imperforate reflecting wall surface 16 is illustrated as being angled at about 45° from one edge of the mounting wall 10. The mounting wall and reflecting wall surface are closed at the top by a wall 18 and at the bottom by a wall 20. There is thus provided between the free edges of the mounting wall 10 and the reflecting wall surface 16 a relatively large opening 22 which is substantially unobstructed although it may be covered by a grill cloth. The vertical dimension of the enclosure is preferably as great as or greater than the width or depth so as to minimize resonance characteristics within the enclosure. Though one speaker is illustrated as carried by the mounting wall, additional speakers are contemplated, either the illustrated form or coaxial forms.

In cone-type speakers, it is characteristic that sound is emitted from the rear of the cone as well as from the front thereof. Thus, sound waves emanating from the rear side of

the speaker, as shown in FIG. 1, will be reflected by the reflecting surface 16 to pass freely outwardly through the relatively large opening 22 at approximately 90° to the axis of the speaker. Thus, these reflected sound waves do not tend to interfere with free vibration of the speaker cone and they are directed outwardly away from the normal position of a listener receiving sound from the front of the speaker cone. As indicated above, the relatively large opening reduces resonance effects within the enclosure. Further, the out of phase waves emanating from the rear of the speaker do not interfere with the waves emanating from the front of the speaker since they have been thus turned through 90°, or approximately so, and are therefore independent and propagated outside of the enclosure.

With reference to FIG. 3, the enclosure B is substantially modified to a triangular form and the reflecting wall surface is of a sandwich-type including an inner reflecting wall surface 24, an outer panel portion 26 and a sand barrier 28 sandwiched therebetween. Otherwise, this enclosure is similar to enclosure A in including the mounting wall 10a and the relatively large egress opening 22a.

The mounting wall and reflecting wall surfaces may be formed of relatively heavy plywood, often three-fourths inch, and the top and bottom walls may be similarly constituted. As indicated, the speaker opening 12 and the enclosure opening 22, 22a may, if desired, be covered with grill cloth which does not materially affect the indicated functions.

The speaker and enclosure assemblies may be either right- or left-handed, as A¹, A² in FIGS. 4, 5 and 6. In FIG. 4, the units A¹, A² are arranged in a console cabinet 30 with the speakers facing forwardly and the open sides of the enclosures facing laterally outwardly. In FIG. 5, the units are also arranged in a console but with the speakers facing laterally outwardly and with the open sides facing forwardly. In FIG. 6, the units A¹, A² are arranged as free standing and may be incorporated in end tables, bookcases and the like—as illustrated, the speakers face laterally inwardly and the open sides of the enclosures face forwardly. In FIG. 7, the units B¹, B² are arranged substantially as illustrated in FIG. 6.

I claim:

1. A loudspeaker enclosure comprising a mounting wall which is apertured to receive the speaker with the speaker cone extending inwardly therefrom and with the axis of the cone being substantially perpendicular to said mounting wall, the aperture being substantially acoustically unobstructed so that sound vibrations emanating from the front of the cone pass through the aperture perpendicular to said axis, and a reflecting wall surface angled inwardly from adjacent one edge of the mounting wall at an angle of about 45° with respect to said mounting wall and said axis and traversing the space behind the speaker cone, said reflecting wall providing with the opposite edge of the mounting wall a relatively large and substantially acoustically unobstructed opening through which sound vibrations emitted rearwardly from the speaker and reflected through an angle of 90° by said reflecting wall surface pass freely in perpendicular noninterfering relation to the sound vibrations emanating from the front of the speaker.

2. A loudspeaker enclosure as set forth in claim 1, wherein the enclosure is in substantially symmetrical triangular form.

3. A loudspeaker enclosure as set forth in claim 1, wherein the reflecting wall surface is imperforate.

4. A loudspeaker enclosure as set forth in claim 1, wherein the reflecting wall surface is of sandwich form including spaced inner and outer panels and a filler in the space therebetween.

5. A loudspeaker enclosure as set forth in claim 4, wherein the filler is sand sandwiched between the said panels.

6. Right- and left-hand loudspeaker enclosures, each as claimed in claim 1, disposed in spaced relationship with open ends of the enclosures opening laterally outwardly and with the speakers facing forwardly.

7. Right- and left-hand loudspeaker enclosures, each as claimed in claim 1, disposed in spaced relationship with the

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open ends of the enclosures opening forwardly and with the speakers facing laterally outwardly.

8. Right- and left-hand loudspeaker enclosures, each as claimed in claim 1, disposed in spaced relationship with the open ends of the enclosures generally forwardly and with the speakers facing generally toward one another.

9. A loudspeaker system comprising an enclosure having a mounting wall with an aperture for exposure to a listening area, and a speaker secured to said mounting wall and having a vibratory cone across said aperture, said cone having its central axis substantially perpendicular to said wall and with one end of the cone lying within said enclosure, said enclosure including a sound-reflecting wall that is presented to said one end of the cone and is intersected by said central axis at an acute angle, means joining said sound-reflecting wall to said

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mounting wall remote from the periphery of said aperture, means forming in said enclosure a relatively large and acoustically unobstructed opening for exposure to said listening area, means for otherwise substantially acoustically closing said enclosure, the excursion of the cone along said axis emitting sound waves unobstructedly through said aperture and also unobstructedly toward said reflecting wall for subsequent reflection through said opening, the sound waves passing through said aperture and the sound waves passing through said opening being substantially at 90° angles with respect to each other and characterized as being in noninterfering relation with each other, and said enclosure being further characterized as permitting substantially free-vibrating motion of the cone.

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