March 5, 1968 D. H. NORTON ETAL 3,371,742

SPEAKER ENCLOSURE

Filed Oct. 21, 1965

FIG. 1.

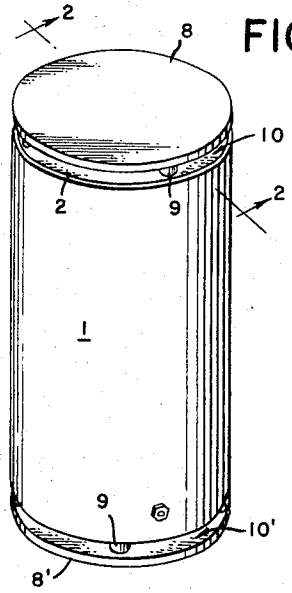
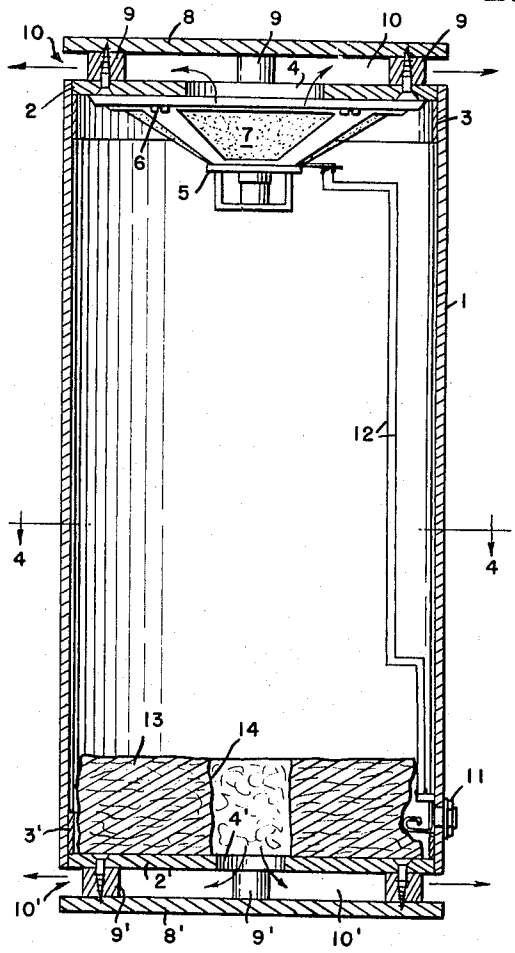


FIG. 2.



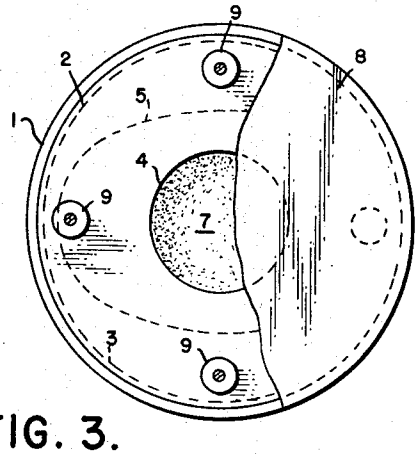


FIG. 3.

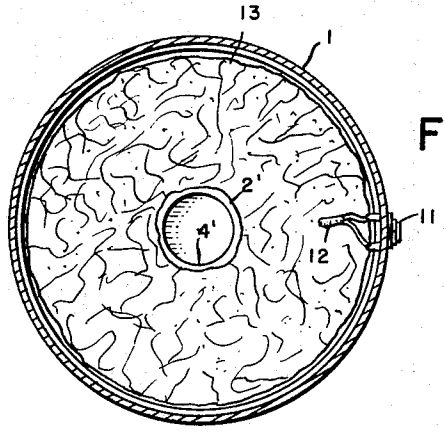


FIG. 4.

INVENTORS
DESMOND H. NORTON
MARTIN A. HARDIN

Garvey & Garvey

ATTORNEYS

United States Patent Office 3,371,742
Patented Mar. 5, 1968

3,371,742

SPEAKER ENCLOSURE

Desmond H. Norton, 1122 Patterson St., Ogden, Utah 84403, and Martin A. Hardin, 1790 South 50th West, Bountiful, Utah 84010

Filed Oct. 21, 1965, Ser. No. 499,449
5 Claims. (Cl. 181—31)

This invention relates broadly to acoustical enclosures for loudspeakers and more particularly to a non-directional speaker enclosure.

An object of the present invention is to provide a novel and simplified construction of an acoustical enclosure for a single loudspeaker of the permanent magnet or dynamic type, which emits and propagates sound waves from opposite ends through 360 degrees.

Another object of the invention is to provide an enclosure for a loudspeaker which is substantially cylindrical in form and pleasing in appearance and constructed for propagating both high and low frequencies from one end thereof over 360 degrees and basically only low frequencies from the opposite end thereof over 360 degrees.

A further object of the invention is to provide a construction of speaker enclosure of the bass reflex type particularly adapted for use with low wattage speakers, but not limited thereto, to provide a speaker enclosure adapted for use in conjunction with low wattage output portable sound equipment such as radios, tape recorders, and the like, for appreciably enhancing the tone quality and amplifying the output from such equipment.

Still another object of the invention is to provide a construction of a speaker enclosure of the above-mentioned character which is highly compact, neat and attractive in appearance so as to serve as a decorative accessory which is compatible with home decor.

Still a further object of the invention is to provide a speaker enclosure of the mentioned character which is simple in construction, economical to manufacture, lends itself easily to mass production techniques, and yet provides sound and tone response comparable to that obtained from more expensive enclosures.

Other objects of the invention reside in the relation of the size of the sound-emitting apertures, at opposite ends of the enclosure, and the manner in which these apertures act in combination with the speaker and ends of the speaker enclosure to emit omnidirectional sound waves in substantially horizontal planes from opposite ends of the enclosure.

Further objects will become apparent to those skilled in the art from the specification hereinafter following by reference to the accompanying drawing, in which:

FIG. 1 is a perspective view of a loudspeaker enclosure according to the invention;

FIG. 2 is an enlarged longitudinal sectional view taken substantially along line 2—2 of FIG. 1;

FIG. 3 is an enlarged top plan view of the speaker enclosure, partly broken away to show the top sound-emitting aperture; and

FIG. 4 is an enlarged cross-sectional view taken substantially along line 4—4 of FIG. 2.

Referring to the drawings in greater detail, wherein, for the purpose of illustration, is shown a preferred embodiment of the invention, reference numeral 1 designates

an upstanding elongated hollow body portion, substantially cylindrical in shape and constructed of fiber board, plastic, or the like. A collar 3 is connected interior of the top end of body portion 1 to provide a mounting flange to which a first circular sounding wall 2 is connected by means of adhesive or the like to close the top end of the cylindrical body portion. A central aperture 4 is provided in first sounding wall 2, as particularly indicated in FIG. 2, and a conical loudspeaker 5 is connected by means of screws 6, or the like, to the interior surface of first sounding wall 2 so that its upwardly opening speaker cone 7 is disposed in registration with aperture 4. The speaker is thus connected in intimate relation with sounding wall 2 which performs as a sounding board for the speaker, and the speaker is connected in depending relation from the wall. It is to be noted that the central aperture 4 is of smaller diameter than speaker 5 or the cone 7 thereof.

A top baffle member 8, preferably circular in shape and of the same diameter as cylindrical body portion 1, is connected in spaced parallel relation with first sounding wall 2 by means of spacers 9. It is preferred that spacers 9 be as small as possible so as not to substantially obstruct sound waves from propagating in all directions from the horizontal sound passage 10 formed in the space between top baffle member 8 and first sounding wall 2. These members may be constructed of wood, or the like, and spacers 9 may be dowel sections connected between members 2 and 8 by means of screws, adhesive, or the like.

A similarly horizontal sound passage 10' is formed at the bottom end of cylindrical body portion 1 by similar elements corresponding to those which form top horizontal sound passage 10, and the corresponding elements have been designated by primed reference numerals. A collar member 3' is connected interior of cylindrical body portion 1 adjacent the lower edge thereof and forms a flange on which second circular sounding wall 2' is connected by means of adhesive, or the like, to close the lower end of body portion 1. Sounding wall 2' is provided with a central aperture 4' disposed in axial alignment with cylindrical body portion 1, speaker 5, and central aperture 4. It has been found that best response results are obtained when aperture 4' in second sounding wall 2' is smaller than central aperture 4 in the first sounding wall 2, and preferably, approximately half the size of said aperture 4. Bottom baffle member 8' of circular shape, and of substantially the same diameter as cylindrical body portion 1, is connected in spaced parallel relation with second sounding wall 2' by means of spacers 9' connected between the members in the same manner as discussed with respect to spacers 9.

This construction provides omnidirectional horizontal passages 10 and 10' at opposite ends of the speaker enclosure when the speaker is used in an upstanding position, which is the preferred position of use, although it could be used in a position where the axis of the cylindrical body portion was a horizontal plane. In the preferred form of use, bottom baffle member 8' serves as a base for supporting the speaker enclosure on a table top, or the like. The speaker enclosure may also be suspended in space by suitable means extending upwardly from top baffle member 8.

An electrical connecting jack 11, or the like, is connected through the wall of cylindrical body portion 1,

preferably adjacent the lower edge thereof and electrical conductors 12 are connected between jack 11 and loudspeaker 5. The speaker enclosure of the present invention is preferably for use with low voltage output transistor radios, tape recorders and the like, so that speaker 5 is preferably a low voltage response reflex type speaker. The speaker enclosure is connected in circuit with the exterior instrument merely by providing a plug-in jack conductor between the instrument and the jack 11. In the case of a portable transistor radio a conductor with a plug-in jack at opposite ends is plugged in at one end in the normal earphone jack connector on the radio and the jack on the opposite end of the conductor is plugged into connecting jack 11 on the present speaker enclosure. It has been found that the speaker enclosure amplifiers and boosts the mid-range and low frequencies of the sound spectrum to provide a better balance with the high frequencies and thus produce better frequency response and more pleasing reception from low voltage instruments of the type described. The cylindrical body portion performs as a resonator and its diameter and length are related to the type of speaker utilized in order to produce the best response. By way of example, a speaker enclosure, according to the invention, which performs as a mid and low frequency amplifier utilizing an appropriate reflex type oval speaker, approximately 5" x 7" in size, will have a cylindrical body portion approximately 14" in length and 8" in diameter with the baffle members 8 and 8' spaced approximately one-half inch from their corresponding sounding walls 2 and 2'. In this arrangement, aperture 4 in first sounding wall 2 is approximately 2½" in diameter and aperture 4' in second sounding wall 2' is approximately 1¼" in diameter.

For the desired response it has been found that aperture 4 must be much smaller than the diameter of the loudspeaker. It has been found that with this arrangement both high and low frequencies propagate from the top end of the enclosure and it is believed that the use of an aperture at 4 of smaller diameter than the diameter of the loudspeaker enhances the low frequency response at the top end of the speaker enclosure. The sound waves emanating from speaker cone 7 through aperture 4 strike baffle member 8, and sound waves propagating from sounding wall 2, due to its intimate connection with the loudspeaker, also strike baffle member 8, and are rebounded therefrom in horizontal sound passage 10 formed between members 2 and 8, and are propagated radially outwardly in an omnidirectional pattern substantially in a horizontal plane defined by sound passage 10, with the sound passage simultaneously restricting the dispersion of the propagating sound waves in the elevation plane.

The sound emerging from the lower end of the speaker enclosure, that is from horizontal sound passage 10', is basically low frequency waves, although some response to the high frequency has been observed. However, the sound waves propagating from the lower end of the speaker enclosure show a marked attenuation of the high frequency sound waves.

The sound waves which originate on the back side of speaker cone 7, which are basically low frequency sound waves, pass into hollow cylindrical body portion 1, which performs somewhat like a tuning cavity having its own resonance point which is determined by the proportions of body portion 1 and the size of aperture 4' at the lower end thereof. As previously indicated the length and diameter of body portion 1 and the diameter of aperture 4' are all factors to be correlated with the individual speaker used within the enclosure and are properly proportioned for a given speaker enclosure according to its output characteristics so that the closure in addition to other matters provides the best resonance effect to enhance the speaker output. Experience has established that aperture 4' in sounding wall 2' results in the best and most effective tone quality from the enclosure when it is proportioned to be approximately one-half the diameter or one-fourth the area of aperture 4 in sounding wall 2 upon which speaker 5 is rigidly mounted. The size of aperture 4' provides a cushioning effect on the air column radiating downwardly from the back of the speaker cone when the speaker is energized.

A circular pad of loose fibrous material 13, such as fiberglass insulation material or other suitable material, is provided within the bore of cylindrical body portion 1 between loudspeaker 5 and second sounding wall 2', and preferably immediately adjacent or upon sounding wall 2', as indicated in FIG. 2. A center aperture 14 is provided in fiber material 13 of a diameter slightly larger than central aperture 4' to provide a passageway for the sound waves to pass through the fibrous material and out of the lower end of the speaker enclosure. Fibrous material 13 tends to act as a sound-dampener for the high frequencies which also radiate from the back of the speaker and the transients which develop within the enclosure due to the hard, smooth interior surface of cylindrical body portion 1 and the interior surface of first sounding wall 2 on which the speaker is mounted. The vibration of this wall also sets up transients within the enclosure. The material also reduces the barrel effect which tends to develop to a degree in the cylindrical enclosure by preventing standing waves and air-column resonance within the enclosure. The fibrous material has been found not to reduce the low frequencies or bass response to any degree so that the sound emerging from the lower end of the speaker enclosure is basically the bass or low frequencies. The sound waves pass through center aperture 14 in the fibrous material and aperture 4' in second sounding wall 2' and pass into the horizontal sound passage 10' formed by bottom baffle member 8' and sounding wall 2'. The low frequency sound waves then propagate radially outwardly in an omnidirectional pattern substantially in a horizontal plane defined by the walls of horizontal sound passage 10', which walls also simultaneouly restrict the dispersion of the propagating sound waves in the elevation plane.

Thus the speaker enclosure of the invention provides a substantially omnidirectional plane of high and low frequencies propagating from the top end of the enclosure and a substantially horizontal plane of basically low or bass frequencies propagating from the lower end of the enclosure in substantially parallel relation. This results in a very pleasant and high quality response from the speaker within the enclosure.

While the invention has been shown and described in a preferred embodiment it is realized that modifications can be made without departing from the spirit of the invention and it is to be understood that no limitations upon the invention are intended other than those imposed by the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States, is as follows:

1. An acoustical enclosure for a loudspeaker comprising an elongated hollow body portion, a first sounding wall closing one end of said hollow body portion, a loudspeaker having an outwardly flaring speaker cone supported by said first sounding wall interior of said hollow body portion in registration with a central aperture in said first sounding wall, which aperture is smaller than the diameter of the speaker cone of said loudspeaker, wherein said sound waves are directed outwardly through said central aperture, a second sounding wall closing the opposite end of said hollow body portion and having a central aperture, smaller than said aperture in said first sounding wall, axially aligned with said loudspeaker and the central aperture in said first sounding wall to direct sound waves from the back of the speaker cone outwardly of said hollow body portion, and a pair of baffle members respectively connected in outwardly spaced relation with said first and second sounding walls at opposite ends of said hollow body portion, whereby said apertured first and second sounding walls and baffle members acting in combination with said loudspeaker are adapted to pro-

duce omnidirectional sound propagating patterns from opposite ends of said hollow body portion in planes substantially normal to the axis of said hollow body portion.

2. An acoustical enclosure for a loudspeaker as set forth in claim 1 in which said elongated body portion is substantially cylindrical in shape.

3. An acoustical enclosure as set forth in claim 1 wherein said baffle members are connected in parallel spaced relation with said first sounding wall and said second sounding wall.

4. An acoustical enclosure as set forth in claim 3 wherein said elongated body portion is substantially cylindrical in shape and said baffle members are circular in shape and substantially coextensive with said first sounding wall and said second sounding wall.

5. An acoustical enclosure as set forth in claim 3 wherein said central aperture in said second sounding wall is approximately half the size of the central aperture in said first sounding wall.

References Cited

UNITED STATES PATENTS

2,065,367	12/1936	Evans	181—31
2,820,526	1/1958	Tavares	181—31

FOREIGN PATENTS

143,597	9/1951	Australia.
1,201,682	7/1959	France.

STEPHEN J. TOMSKY, *Primary Examiner.*