

# United States Patent

[11] 3,590,941

[72] Inventor **John A. McKenzie**  
North Vernon, Ind.  
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[73] Assignee **Arvin Industries, Inc.**  
Columbus, Ind.

2,815,087 12/1957 Delort ..... 181/31  
2,816,619 12/1957 Karlson ..... 181/27

Primary Examiner—Stephen J. Tomskey  
Attorney—Trask, Jenkins & Hanley

[54] **SPEAKER ENCLOSURE**  
8 Claims, 3 Drawing Figs.

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[50] Field of Search ..... H04r 1/28

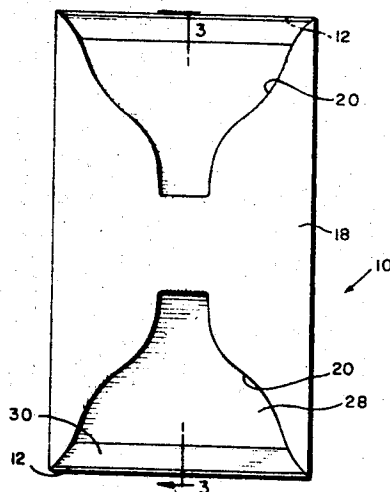
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[56] **References Cited**  
**UNITED STATES PATENTS**

2,210,477 8/1940 Benecke et al. .... 181/31  
2,239,170 4/1941 Gray ..... 181/31  
2,643,727 6/1953 Leon ..... 181/31

**ABSTRACT:** A speaker enclosure for improving the frequency response of a loudspeaker. The speaker is placed within the enclosure and has its face aligned perpendicularly with the front side of the enclosure, so that the speaker axis is directed parallel to the sound output opening of the enclosure. The smallest dimension of the speaker face corresponds with the depth of the enclosure, and said speaker face is sealed against a baffle system which forms a channel directed divergently outward from the speaker toward one end of the enclosure. A faceplate is sealed over the front of the enclosure and against the forward edge of the baffle system, said faceplate being provided with a cutout portion over the channel of the baffle system. The cutout portion is narrow at the face of the speaker, and becomes gradually wider toward the end of the enclosure to control the uniformity of the frequency response of the enclosure.



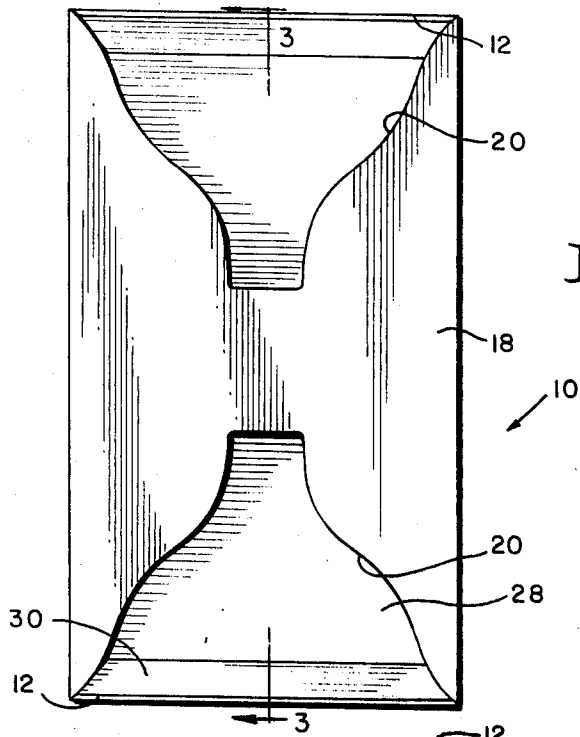


Fig. 1

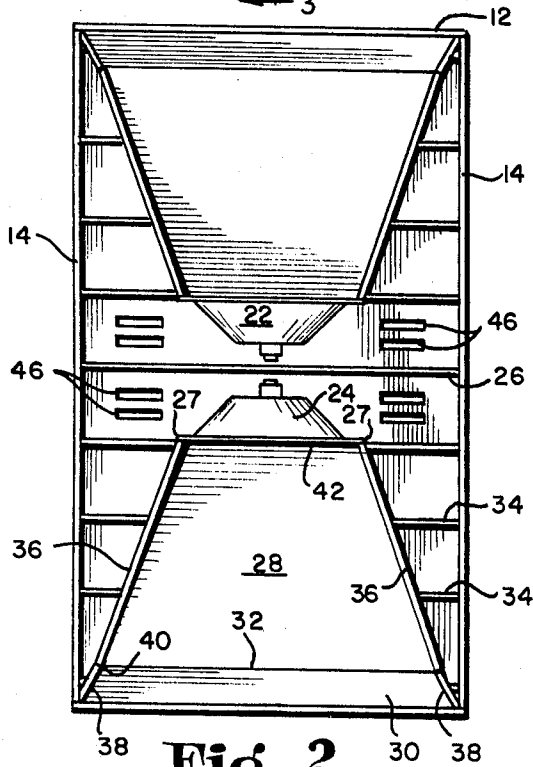


Fig. 2

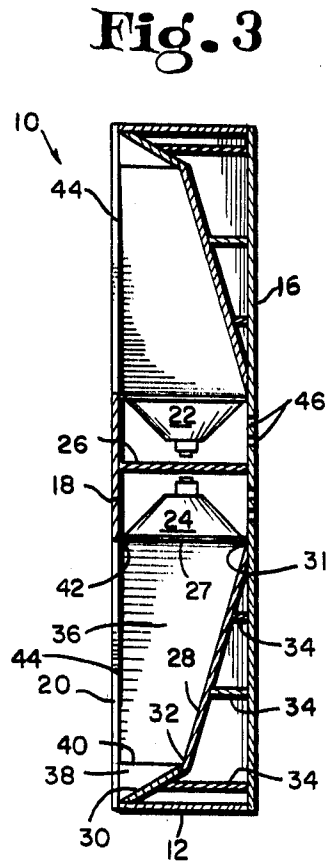


Fig. 3

INVENTOR.

JOHN A. McKENZIE

BY

Trask, Jenkins & Hanley  
ATTORNEYS

## SPEAKER ENCLOSURE

## BACKGROUND OF THE INVENTION

Speakers are available over a wide price range depending primarily on their frequency response and power output capabilities. Generally, an inexpensive speaker has a relatively poor frequency response and a low power output capability, and therefore is normally used only with small radios, phonographs, or tape recorders, where a large and more expensive speaker system is not desirable. Thus, the sound reproduction of a portable unit is normally of inferior quality.

It is an object of this invention to provide a speaker enclosure which requires a relatively small volume, but which improves greatly the frequency response of a small and inexpensive speaker as is commonly used in portable sound devices.

## SUMMARY OF THE INVENTION

In accordance with the invention my speaker enclosure comprises a cabinet having a sound output opening in one side, and having a speaker mounted with its axis parallel to the plane of said opening. The speaker is disposed at one end of the cabinet and has a plurality of baffles sealed against its output face and directed toward the other end of the cabinet, said baffles providing a channel diverging outwardly from the face of the speaker. A faceplate fits over the channel formed by the baffles, and it has an opening therein which forms the sound output opening of the enclosure. The opening in the faceplate is somewhat horn shaped, beginning narrowly at the face of the speaker, and extending in a diverging manner outward toward the other end of the cabinet.

Preferably, the speaker has a rectangular face arranged with its minor dimension corresponding to the depth of the cabinet, so that the depth dimension of the cabinet is about the same as the minor dimension of the speaker. A rear baffle is sealed against the rearward major dimensional edge of the speaker and extends toward the other end of the enclosure along a gradually slanted line toward the front of the enclosure. This baffle surface has a sharp transition near said other end of the cabinet and angles more sharply toward the sound opening face of the enclosure. A pair of side baffles are sealed against the minor dimensional edges of the speaker and slant outwardly toward the other end of the enclosure, until they reach said transition point where they turn outwardly to angle more sharply toward the corners of the cabinet at said other end. The faceplate is sealed against the forward edge of the speaker and against the forward edges of the side baffles so that there can be no interaction between the air at the rear of the speaker and the air at its output face.

The opening in the faceplate of the device can be adjusted to tune the enclosure to provide a flat frequency response by placing notches or extensions in the wall of said opening. The narrow portion of the faceplate opening, adjacent the output face of the speaker, is associated with the high frequencies of the frequency response, while the broad outer portion of the opening is associated with the low frequency sounds generated by the speaker. Thus, any peaks or valleys in the frequency response, from the high end to the low end, can be smoothed out by placing a notch or extension in the edge of the faceplate corresponding to the frequency of that peak or valley. Similarly, the high or low end of the frequency response can be effectively cut off by blocking the opening at its narrow or broadened ends.

## BRIEF DESCRIPTION OF THE DRAWING

The accompanying drawing illustrates the invention. In such drawing:

FIG. 1 is a front elevation of a speaker enclosure embodying my invention;

FIG. 2 is a front elevation of the enclosure shown in FIG. 1 but with the faceplate removed therefrom; and

FIG. 3 is a vertical section taken along line 3-3 of FIG. 1.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

The enclosure, as shown in the drawing, is formed by a rectangular cabinet 10 having sidewalls 14, end walls 12, and a backwall 16, and including a faceplate 18 having sound output openings 20 provided therein. The drawing shows two speakers 22 and 24 housed in a single enclosure which is divided into sections by a partition 26 interconnected between the sidewalls 14 at the center of the cabinet. It is to be understood, however, that where a high-power output is not required, a single speaker may be used, whereupon the partition 26 would comprise one of the end walls of the single speaker cabinet.

The interior of the enclosure is illustrated in FIG. 2 where the faceplate 18 has been removed, and said interior holds a plurality of baffles which are placed in a particular configuration to affect the frequency response of the speakers. As shown, the device is symmetrical about the partition 26, and therefore only one-half of the enclosure will be described. The speaker 24 may be a small inexpensive device such as a 3x5 speaker commonly used in single speaker home entertainment units. Said speaker 24 is mounted with its axis parallel to the front plate of the cabinet, and with its minor dimensional edges 27 corresponding to the depth of the cabinet. Thus, the sound waves generated by the speaker are directed toward the end panel 12 of the cabinet rather than directly outward as in other commonly known enclosures. One portion of the baffle structure is formed by rear baffles 28 and 30 and functions to direct the sound waves outwardly from the opening 20 in the faceplate 18. Therefore, the baffles 28 and 30 are arranged on a slant from back to front in the enclosure, starting at the rear edge 31 of the speaker and terminating at the forward edge of the end of the enclosure. The baffle 28 extends at a gradual angle from said rear edge of the speaker toward the end of the cabinet, while the baffle 30 extends from the outer end 32 of baffle 28 and angles sharply toward the faceplate of the enclosure, adjacent the end 12, thereby giving the effect of directing the sound waves outwardly. Desirably, the two baffles 28 and 30, together with their angular transition as shown at 32, could be replaced by a single exponentially curved baffle (not shown) for performing this sound-directing function. The rear baffles 28 and 30 are supported by braces 34 fixed to the rear side 16 of the enclosure; or, alternatively the cabinet may be molded or assembled so that said rear baffles serve also as the backwall 16 of the device.

The baffle structure further comprises two pairs of side baffles, each pair being formed by an inner section 36 and an outer section 38, and said pairs extending respectively from the minor edges 27 of the speaker 24, diverging outward toward the end of the cabinet. The inner baffle 36 in each pair extends at a lesser angle than the outer one 38 and is about as long as the rear baffle 28. The second baffle 38 in each pair extends from the end 40 of the inner baffle to the end of the cabinet at a sharp angle toward the sides 14 thereof. Thus, the distance between the pairs of baffles increases as said baffles extend toward the end of the cabinet; and, the baffles 28, 30, 36, and 38 combine to provide a channel extending from the face of the speaker toward the end of the enclosure, and becoming wider as it approaches the enclosure end. It has been found preferable to make the outer end of the channel about twice as wide as the major dimension of the speaker.

The forward edge 42 of the speaker is coplanar with the forward edges of the enclosure, and with the forward edges 44 of baffles 36 and 38, so that when the faceplate 18 is applied to the enclosure it contacts all of these forward edges. A resilient gasket or bead of sealing compound is applied to said forward edges of the baffles and speaker to form a seal between the front plate and the channel so that the air is isolated between the front and rear of the speaker. Furthermore, the air at the rear of the two speakers is divided and isolated by the panel 26, and air openings 46 are provided in the rear wall of the enclosure.

The openings 20 in the faceplate 18 are shaped to tune the frequency response of the sound emitted from the channel. Each opening 20 begins at the forward edge of the speaker with which it is associated, and the walls of the opening project in parallel for a short distance from the face of the speaker as the opening extends toward the end of the enclosure. Said opening is narrow at its parallel portion adjacent the face of the speaker, and has a width equal to about one-third the major dimension of the speaker. The walls of the opening curve outwardly as they extend toward the end of the enclosure, and then slant at an angle toward the corners of the enclosure to correspond with the edges of the baffles 38. It has been found that high notes move a smaller amount of air than do the bass notes generated by a speaker, and therefore the width of the opening is small adjacent the speaker so that the high end of the frequency response can be controlled by widening or narrowing the width of the opening adjacent the speaker face. Accordingly, the width of the opening is greater toward the end of the enclosure where the bass notes are more prominent and where a greater volume of air must be moved. Similarly, the opening can be widened or narrowed at the end of the enclosure to trim the frequency response at its low end.

In summary, the speaker enclosure as described herein receives the speaker on its side to require a relatively small form factor while permitting a baffle system to operate on the sound output. The rear baffles 28 and 30 and side baffles 36 and 38 cooperate with each other to define a channel for directing the sound out the front of the enclosure. The faceplate 18 seals over the channel forming an enclosed compartment, with the plate opening 20 extending over a portion of the channel in an exponentially diverging manner from the face of the speaker, and then extending angularly toward the outer ends of the side baffles, to control the frequency response curve of the enclosure.

I claim:

1. A speaker enclosure, comprising a housing having an open front face; a speaker mounted in said housing and having its output face directed perpendicularly to said front face; baffle means open to said front face and extending laterally and forwardly outwardly from the output face of the speaker toward said front face; and a faceplate covering said front face of said housing and abutting said baffle means to form an enclosed compartment with said baffle means and speaker output face, said faceplate having an opening therein disposed over said compartment; said faceplate opening diverging laterally outwardly from the speaker output face for controlling the frequency response of said compartment.

2. The invention as set forth in claim 1 in which said baffle means extend divergently away from the sides of the speaker output face.

3. The invention as set forth in claim 1 with the addition that a second speaker is mounted in said enclosure with the rear sides of said speakers lying adjacent each other and their output faces directed in opposite directions; second baffle means open to said front face and extending laterally and forwardly outwardly from the output face of the second speaker toward said front face; said faceplate forms a second enclosed com-

partment with said second baffle means and second speaker output face; and said faceplate has a second opening therein disposed over said second compartment and diverging laterally outwardly from said second speaker output face for controlling the frequency response curve of said second compartment.

4. A speaker enclosure, comprising a housing having an open front face; a speaker mounted in said housing and having its output face directed perpendicularly to said front face; a rear baffle extending from the speaker output face at the rear of the housing toward the front face of the housing and away from the speaker output face; a pair of side baffles extending respectively along the sides of said rear baffle and each extending from the sides of the speaker and from front to rear in the housing; said side and rear baffles forming a channel in communication with, and extending away from, the output face of the speaker; and a faceplate covering said front side of said housing and having an opening therein disposed over said channel; said faceplate opening diverging laterally outwardly from the speaker output face for controlling the frequency response curve of said channel.

5. The invention as set forth in claim 4 in which said side baffles diverge laterally outwardly from said output face toward the end of said channel remote from the speaker.

6. The invention as set forth in claim 5 in which said faceplate opening is narrower than said channel at the speaker output face with the lateral edges of said opening extending laterally from said speaker output face toward the sides of the channel in an exponential manner, and then angling further laterally outward adjacent the outer end of the channel.

7. The invention as set forth in claim 6 with the addition that said faceplate opening is narrower than said channel at the speaker output face with the lateral edges of said opening extending laterally from said speaker output face toward the sides of the channel in an exponential manner, and then angling laterally outwardly adjacent the outer end of the channel, said side baffles diverging laterally from said output face toward the outer end of said channel, the angle at which said side baffles and said rear baffle extend from said output face becoming more obtuse at a common plane adjacent the end of the enclosure remote from the speaker.

8. The invention as set forth in claim 4, with the addition that a second speaker is mounted in said enclosure with the rear sides of said speakers lying adjacent each other and their output faces directed in opposite directions; a second rear baffle extends from the second speaker face at the rear of the housing toward said housing front face; a second pair of side baffles extends respectively along the sides of said second rear baffle from said rear baffle to said housing front face; said second side and rear baffles forming a second channel in communication with the output face of the second speaker; and said faceplate covers said second channel and has a second opening therein disposed over said second channel and diverging laterally outwardly from said second speaker output face for controlling the frequency response curve of said second channel.