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LOUD SPEAKER ENCLOSURES

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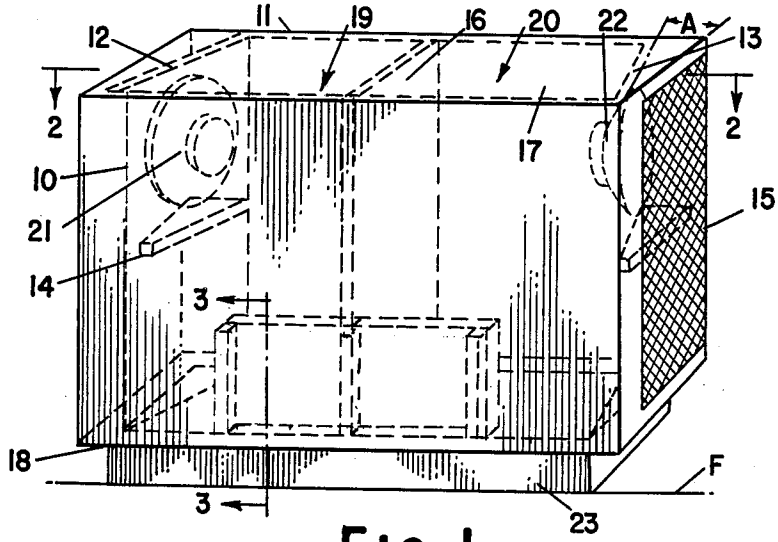


FIG. 1

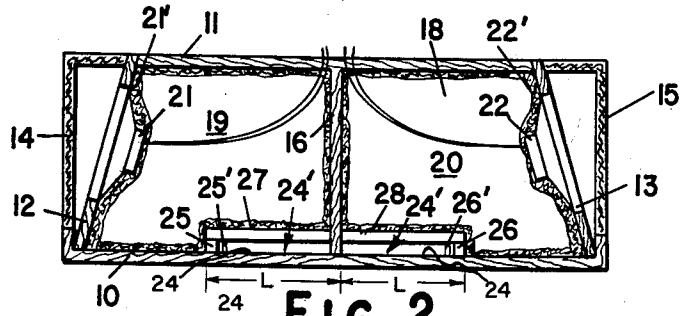


FIG. 2

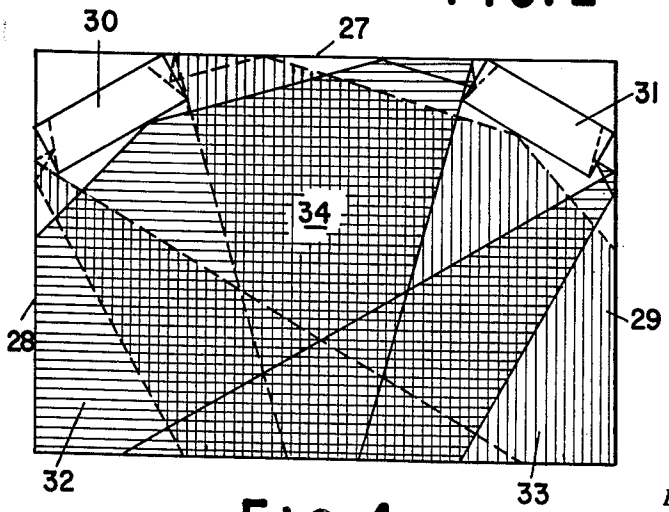


FIG. 4.

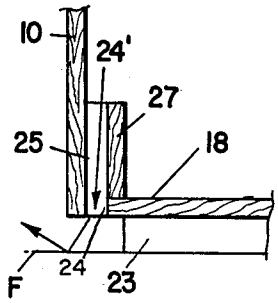


FIG. 3.

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LOUD SPEAKER ENCLOSURES

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This invention relates generally to sound reproducing apparatus and more particularly to improved loud speaker enclosures primarily designed for private or home use.

To improve fidelity of sound reproduction by conventional loud speakers, it is common practice to mount one or more such speakers within a suitable cabinet or enclosure. The enclosure itself is designed to accentuate the lower or bass frequencies. This is achieved by dimensioning the interior of the enclosure to define a volume of air which has a natural resonance at a given low frequency. By providing an auxiliary or "bass reflex" opening in the conventional speaker baffle, an air piston effect is provided which, in conjunction with the sound reproduced directly by the speaker, results in a generally uniform sound level over a wide range of both low and high frequencies.

In addition to a substantially flat frequency response over the largest possible audio range, it is also desirable to eliminate the "appearance" of the speaker itself, as well as any other "point source" of sound. The appearance of grill cloth and the attendant mystery of what is behind the cloth is not psychologically conducive to realism. Proper camouflaging of the speaker as well as other point sources not only improves the aesthetic appearance of the sound enclosure from a psychological point of view but will also avoid "beaming," especially of higher frequency signals and particularly when stereophonic sound is used.

Other important considerations are to provide a high quality sound with high efficiency and still maintain a relatively small size so that the speaker enclosure will properly fit within conventional residential homes. It is also desirable that the enclosures be inexpensive and easy to manufacture to the end that the final cost to the customer is maintained within reasonable limits.

With the forgoing in mind, it is accordingly a primary object of this invention to provide an improved speaker enclosure for providing high quality sound with high efficiency.

More particularly, it is an object to provide an improved speaker enclosure in which the appearance of any one or more speakers or other point sources is eliminated, to the end, first, that psychological realism in listening to sound from the system is increased and to the end, second, that undesirable "beaming" effects are avoided.

Other important objects of the invention are to provide improved speaker enclosures meeting the foregoing objects which are relatively small in size, practical in appearance so that they will fit readily within conventional homes with other furniture, and which may be easily and inexpensively manufactured.

An auxiliary object is to provide an improved monophonic speaker enclosure which may be used with an identical additional monophonic enclosure at another location in a room to provide greatly improved stereophonic reproduction.

Briefly, these and many other objects and advantages of this invention are attained by providing a speaker enclosure comprising a solid continuous front wall, side walls converging towards each other in a rearward direction, a rear wall, and top and bottom walls. The enclosure includes a central partition dividing the interior into left and right speaker chambers of identical dimensions. The side walls themselves are provided with

openings for respectively mounting left and right speakers. Rather than a bass reflex principle, the forward bottom wall of each of the enclosures is provided with an elongated slot so that sound generated within each of the chambers can pass downwardly through the slot and under the lower front edge of the front wall. In this respect, the entire enclosure is supported on a recessed base structure so that the floor actually constitutes a part of the enclosure structure insofar as guiding sound from the bottom front slot is concerned. The rest of the interior walls of the left and right chambers are air tight so that a proper air piston effect is provided.

With the front of the speakers directing sound normally away from the side walls which, in turn, converge towards each other in a rearward direction, it will be evident that the speakers themselves will not be visible from the front of the enclosure. Further, by driving the speakers in phase, pressure variations in the left and right speaker chambers will be exerted simultaneously on the central partition and thus cancel each other. Similar cancellation effects will result on the front and rear walls so that there is effectively provided a perfectly rigid cabinet structure.

By strategic positioning of one or more of the enclosures in a room, proper reflection from the walls of the room themselves as well as the front continuous walls of the speakers will eliminate undesirable beaming effects characteristic of some prior art devices. Moreover, the "hole in the middle" between two spaced speakers is eliminated.

A better understanding of the invention will be had by now referring to a preferred embodiment thereof as illustrated in the accompanying drawings, in which:

FIGURE 1 is a perspective view showing a speaker enclosure designed in accordance with the present invention wherein the interior portions are indicated in phantom lines;

FIGURE 2 is a top cross section taken generally in the direction of the arrows 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary cross section taken in the directions of the arrows 3—3 of FIGURE 1; and,

FIGURE 4 is a schematic plan view of a room wherein two speaker enclosures of the type shown in FIGURE 1 are employed for illustrating the reproduction of stereophonic sound.

Referring first to FIGURE 1, the speaker enclosure comprises a flat, solid, continuous front wall 10, a rear wall 11, and left and right side walls 12 and 13 converging towards each other in a rearward direction as indicated by the phantom lines. The convergence of each side wall is indicated at A and is preferably fifteen degrees. To maintain a generally rectangular appearance, however, suitable frame portions with grill cloth, such as indicated at 14 and 15, extend directly rearwardly from the front wall 10.

The enclosure is completed by a central vertical partition 16 extending normally between the front wall 10 and rear wall 11 and suitable top and bottom walls 17 and 18. As shown in both FIGURES 1 and 2, the partition 16 divides the interior of the enclosure in to left and right speaker chambers 19 and 20 incorporating suitable speakers 21 and 22, respectively. As shown, the speakers are mounted to the side walls 12 and 13 and are oriented to direct sound from their front portions normally away from the side walls 12 and 13. Preferably, the rear speaker cone portions are padded with acoustic damping material 21' and 22' as shown schematically in FIGURE 2 to reduce driver resonance.

The entire enclosure, as described thusfar, is supported on a recessed base structure 23 such that the lower edges of the front, and side walls, as well as the bottom

wall, are held at a given level above a floor F. The recessed base portion not only increases the aesthetic beauty of the speaker enclosure as such that also serves an important function as will be evident by now referring in detail to FIGURES 2 and 3.

Thus, it will be noted that the left and right speaker chambers are provided with slots 24 respectively positioned at the forward bottom portion of the bottom wall 18. The slots face downwardly and are formed by cutting a suitable elongated notch in the central front portion of the bottom wall 18. Further defining the slots are upright members 25 and 26 cooperating with panels 27 and 28. The upright members 25 and 26 together with the panels 27 and 28, the opposite front side wall portions of the partition 16, and the inside surface portions of the front wall 10 define channels 24 which open at their upper ends in the speaker chambers as indicated by the phantom line in FIGURE 1 and terminating in the slots 24 at their lower ends.

With particular reference to FIGURE 3, the structure will be clearer wherein the slot 24 is shown as the bottom end portion of an elongated vertical channel 24'.

With the foregoing arrangement, and with the recessed base structure 23 supporting the enclosure at a given level above the floor F, sound may pass through the slots 24 to hit the floor F and thus be reflected under the lower front edge of the front wall 10. To this extent, then, the floor itself constitutes a part of the enclosure in properly directing the sound forwardly. Because the slots open downwardly behind the lower edge of the front panel, they are not visible, and thus do not appear as point sources. The entire structure is distinguished from conventional bass reflex type enclosures in that the slots 24 are not disposed on the same panels supporting the speakers themselves. Moreover, their action is additive in effect when the speakers are driven in phase.

The advantages realized from the foregoing described structure will be evident by again referring to the plan view of FIGURE 2. Preferably, the speaker chambers 19 and 20 are each tuned to define a volume of air resonant at approximately thirty cycles per second. This tuning can be achieved by varying the longitudinal dimension of the slots 24 as by suitable fillers 25' and 26' disposed against the upright members 25 and 26. With the chambers tuned to approximately thirty cycles, proper bass levels will be maintained during operation.

In addition, by driving the speakers 21 and 22 in phase, pressure variations in the chambers 19 and 20 will also be in phase and thus will be exerted simultaneously on opposite sides of the partition 16, thereby cancelling each other. As a consequence, the partition 16 will be mechanically motionless and will appear as a rigid wall.

Similarly, the pressure variations exerted on the front and rear walls 10 and 11 by the separate chambers will tend to cancel each other. Thus, for example, an increase in pressure in the chamber 19 tending to bow out the rear wall portion 11 constituting the rear portion of that chamber will, in the absence of a corresponding pressure in the chamber 20, tend to bow in the portion of the wall 11 enclosing the rear chamber 20. However, when this same pressure is simultaneously exerted on the wall portion covering the chamber 20, the referred to bowing in will not occur, and cancellation will again take place, thereby resulting in the simulation of a completely rigid rear enclosing structure. Similar action occurs with respect to the front panel 10.

The convergence of the sidewalls 12 and 13 of fifteen degrees constitutes a compromise, and it is found that with such angle the enclosure operates both against a flat wall and in a corner with excellent results. Typical dimensions of the preferred embodiment of the enclosure when employed with two eight inch speakers and when

properly tuned would be thirty-three inches wide at the front with the side walls converging at fifteen degrees rearwardly; a depth of twelve and one-fourth inches, and a height of twenty-four and three-fourths inches, the base structure being about two inches in height. The slots are about seven inches long each, three-fourth inches wide, and the vertical length of the channel in FIGURE 3 is six inches.

FIGURE 4 illustrates one manner in which the speaker enclosures of this invention may be employed for both monophonic and stereophonic sound reproduction. As shown, there is illustrated a room having a rear wall 27 constituting a common wall to define left and right rear corners with side walls 28 and 29, respectively. Within the left and right corners, there are provided speaker enclosures 30 and 31 which are identical to the speaker enclosure described in connection with FIGURES 1–3. Preferably, the speakers form approximately a thirty degree angle with the rear common wall 27. With the foregoing arrangement, the manner in which sound is directed and reflected by the walls as well as the front rigid panels of the speakers themselves is illustrated. For the left speaker 30, the vertical lines such as shown at 33 designate those areas in which maximum intensity will be heard. Similarly, for the speaker 31, the horizontal lines show at 32 similar areas on the opposite side of the room. The area in which both speakers can best be heard is indicated by the grid 34.

It will be evident from the diagram that the acoustical addition effectively eliminates the "hole in the middle" between the speakers 30 and 31. Moreover, it will be evident that full depth and direction are maintained in the adjacent wall reflections. In addition, the effective reversal of beaming gives an illusion of bigness and fullness not realized with conventional designs. In moving about the room shown in FIGURE 4, center stage persists in remaining center stage whether the listener is in the left or right portions of the room, and left and right information retains a balance uniquely equivalent to that of walking from one side of a performing group to the other. It will be evident from the diagram in FIGURE 4 that "point sources" and beaming are virtually eliminated.

The present invention has thus provided a speaker enclosure of high performance, high efficiency and unusual flexibility of use. The relatively small size and design are directed to the desirable end of substantially complete elimination of the speaker and other point sources as such. Since the enclosure is basically an unobtrusive piece of furniture, principally as a consequence of the flat, continuous, solid front wall, and does not present the listener with the mystery of what is behind the grill cloth, there is an added psychological realism of the performers actually being present rather than speakers themselves doing the performing.

While only one embodiment of the invention has been described in detail, various changes and modifications can be made without departing from the scope and spirit of the invention. The speaker enclosure is therefore not to be thought of as limited to the exact embodiment set forth merely for illustrative purposes.

What is claimed is:

1. A loud speaker enclosure comprising: a solid front wall; left and right side walls; a rear wall; top and bottom walls; and a vertical central partition extending normally between said front and rear walls to divide the interior of said enclosure into left and right speaker chambers, said left and right side walls respectively having openings for accommodating left and right speakers, said chambers including side supports and back panels defining with opposite front portions of said partition and inside surface portions of said front wall, channels having upper openings within said chambers and lower ends terminating in slots along the intersection of said front wall and bottom wall opening downwardly past said bottom wall and around the lower edge of said front wall to the exterior

of said enclosure, the longer dimensions of said channels being variable to tune said chambers.

2. An enclosure according to claim 1, including a base structure for supporting said enclosure at a given distance above a floor, said slots opening towards said floor whereby said floor defines a part of said enclosure in directing sound from said slots.

3. An enclosure according to claim 2, in which said left and right side walls converge towards each other in a rearward direction.

4. A loud speaker enclosure comprising, in combination: a flat solid continuous front wall; left and right side walls extending rearwardly and converging towards each other, said side walls having speaker openings respectively for mounting left and right loud speakers in a position to direct sound from their front portions normally outwardly from said side walls; a rear wall connecting the rear edges of said side walls; top and bottom walls; and a vertical partition extending normally between said front and rear walls to divide said enclosure into left and right speaker chambers having the same volumes and constituting mirror images of each other with respect to the plane of said partition so that pressure variations exerted on opposite sides of said partition when said speakers are driven in phase are cancelled; said chambers including side supports and back panels defining with opposite front

portions of said partition and inside surface portions of said front wall, channels having upper openings within said chambers and lower ends terminating in slots at the intersection of said front wall and said bottom wall passing through said bottom wall, the longer dimensions of said channels being variable to tune said chambers; and a recessed base supporting said enclosure at a given level above a floor so that sound can pass out from each of said channels and pass under the lower edge of said front wall.

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