

[54] **BACK LOADED FOLDED CORNER HORN
SPEAKER**

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181/199

[51] Int. Cl.² **H05K 5/00**

[58] Field of Search 181/156, 152, 147, 189,
181/199

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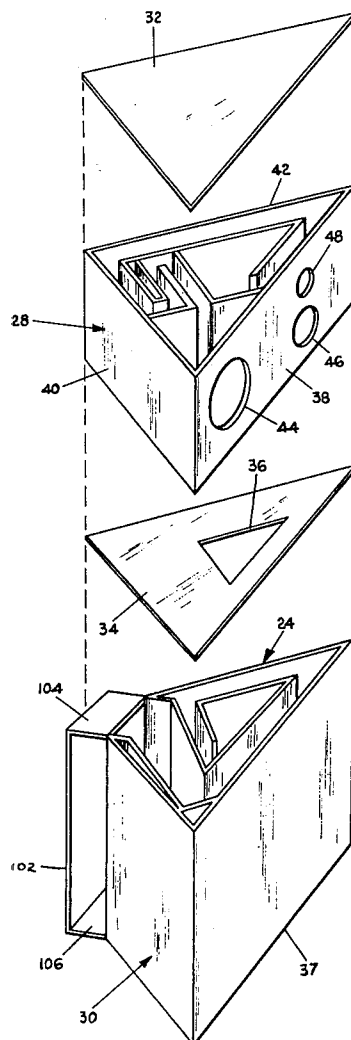
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[57]

ABSTRACT

A back loaded, folded corner horn speaker adapted to be placed in the corner of a room comprises direct radiating low, mid-range, and high frequency drivers mounted on a baffle at the front of the enclosure and a hyperbolic-exponential folded corner horn fitted into the enclosure so as to back load the low frequency speaker. The length of the horn is one-quarter of the wavelength of the low frequency cut-off frequency of the horn. The horn follows an inwardly converging spiral path in an upper compartment of the speaker enclosure and then passes downwardly into a lower compartment, wherein it follows an outwardly expanding spiral path to a horn outlet in the back of the speaker, which faces directly into the corner of the room. The horn continues to expand from the horn outlet through a space between the side panels of the enclosure and the walls forming the corner of the room to a mouth of the horn at the front of the speaker. The speaker employs an eight-inch low frequency driver that operates over its full frequency range; a mid-range driver that cuts in at 800 hertz; and a high frequency driver that cuts in at 5,000 hertz.

22 Claims, 6 Drawing Figures



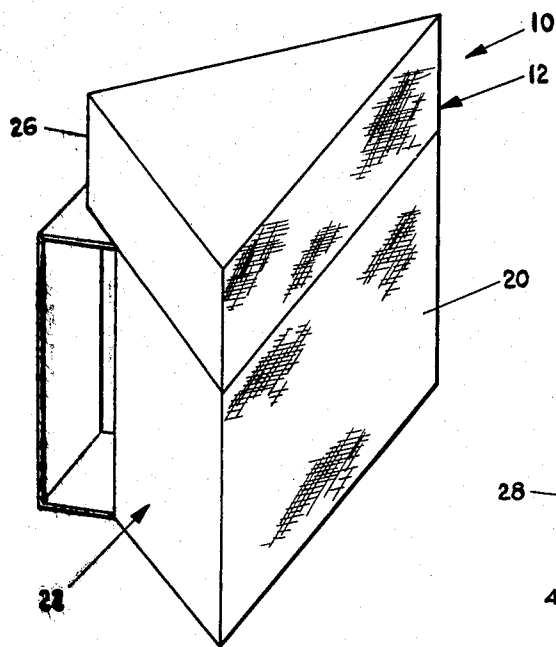


FIG. 1

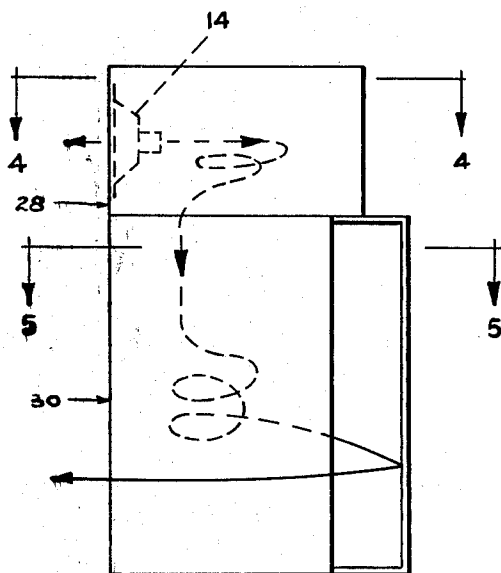


FIG. 2

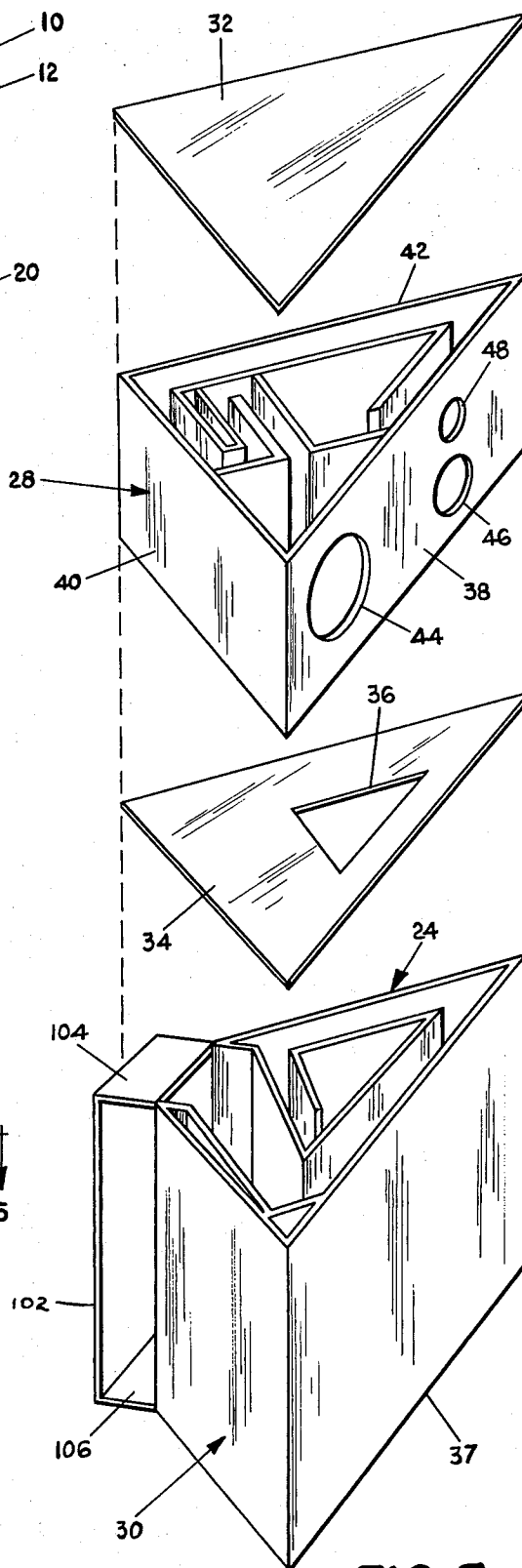


FIG. 3

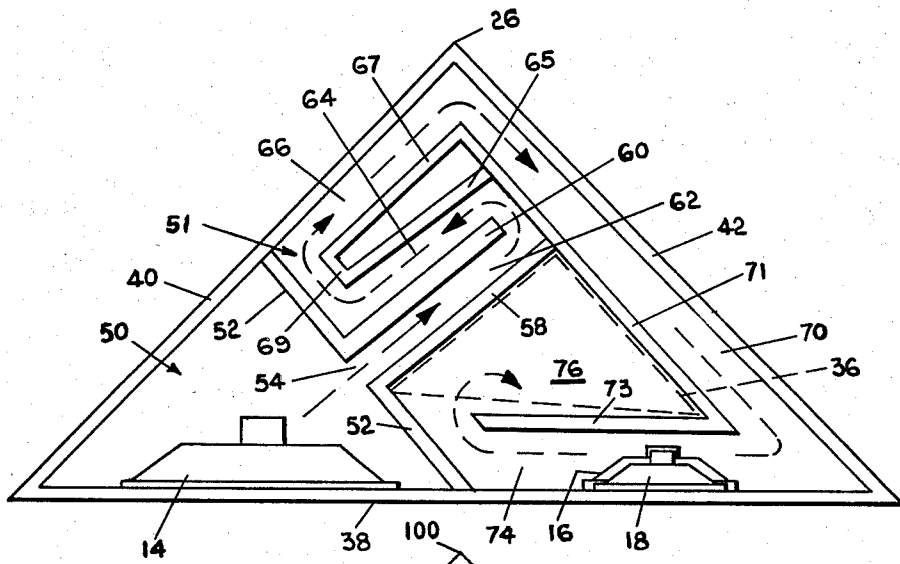


FIG. 4

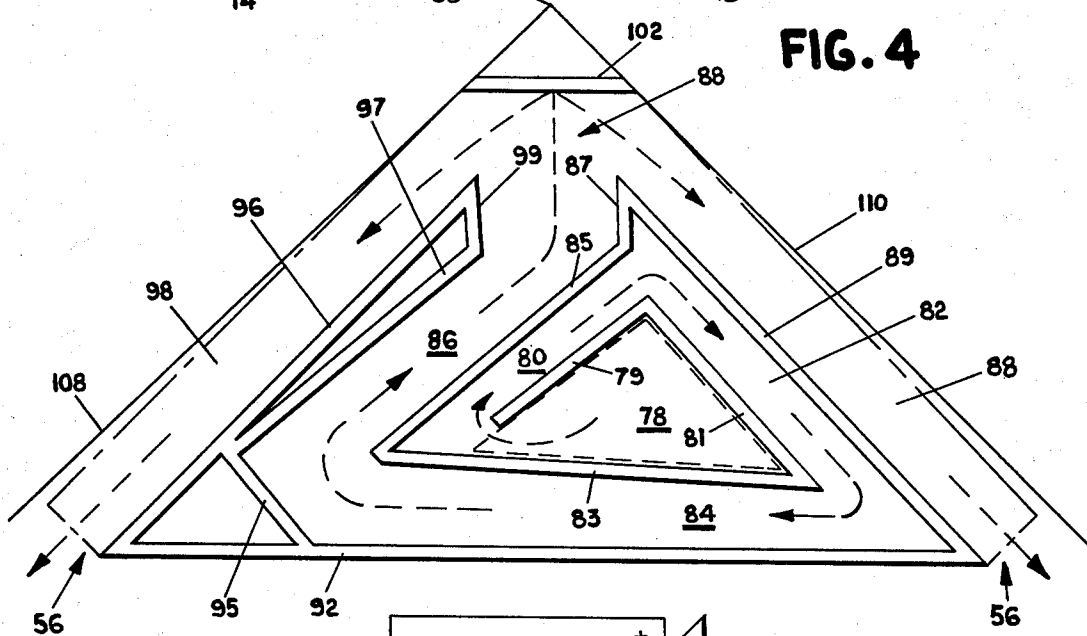


FIG. 5

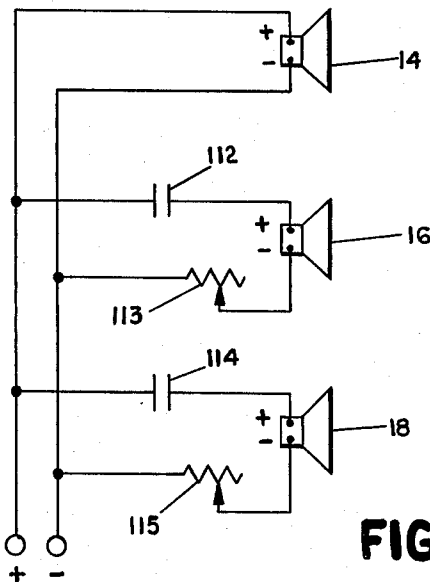


FIG. 6

BACK LOADED FOLDED CORNER HORN SPEAKER

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to high fidelity loud speakers and more particularly to a back loaded, folded corner horn speaker, wherein the mid-range and high frequency drivers are direct radiating to the front and the low frequency driver is direct radiating to the front and horn loaded at the rear with a one-quarter wavelength hyperbolic-exponential horn.

2. Description of the Prior Art

The performance of most speakers is enhanced when the speaker is placed in the corner of a room, and this effect is enhanced when the speaker is specifically designed for placement in the corner of a room. In such a design, the speaker is usually generally triangular in shape, with the front panel facing outwardly into the room and side panels converging inwardly from the sides of the front panel to the back edge or corner of the enclosure facing the corner of the room. Two features of speaker response generally enhanced by corner placement of the speaker are an improvement in bass response and an improvement in sound direction and dispersion within the room.

Another device commonly used for enhancing base response is "horn loading" of a low frequency driver with a long expanding horn. Ideally, the horn should be equal in length to the wavelength of the desired low frequency cut-off frequency of the horn, which for a 30 hertz cut-off frequency (fc) would be equal to approximately 36 feet in length. The horn itself may be formed in several shapes, principally, conical, exponential, and hyperbolic-exponential, with the concavity of the horn increasing in the order named. In most applications, the shape of the horn employed is exponential.

Because of the unusual size of a straight axis horn that is a full wavelength in length, it is most common to employ a horn that is only a fraction of the wavelength of the cut-off frequency of the horn, with a one-quarter wavelength horn being next most desirable. Because of space limitations, a one-eighth wavelength horn is frequently used. Also, in order to avoid the problem of undue length of the horn projector, speakers have been designed wherein the horns are folded so as to fit into a speaker enclosure of more conventional dimensions.

In one popular version of a folded horn enclosure, the horn is folded into an enclosure designed for corner placement of the speaker, and the outlet of the horn emanates at the back of the speaker directly into the corner of the room. The side walls of the speaker enclosure are spaced apart a predetermined distance from the side walls, so that the audio output emanating from the back of the enclosure passes between the side walls of the enclosure and the side walls of the room and emanates from the speaker enclosure at the front of the speaker. In such a speaker, the side panels of the speaker enclosure and the walls of the room constitute an integral part of the horn projector, with the mouth of the horn being the area between the walls of the room and the side panels of the projector at the front of the speaker enclosure. By using the space between the enclosure and the side walls of the room, the effective length of the horn and the effective size of the speaker enclosure can be increased without actually

increasing physical dimensions of the speaker enclosure. This type of speaker also enhances the directivity of the speaker.

In the speaker referred to above, with the exception of the horn outlet, the enclosure is a sealed container, and the low frequency speaker is mounted on the interior of the speaker enclosure with the front of the speaker being connected to the horn projector. Thus the entire output of the speaker is projected from the speaker through the horn via the corner of the room. The length of the horn is approximately one-eighth of the wavelength of the cut-off frequency of the horn. Some of the performance potential of this speaker enclosure is lost in this manner, since a one-eighth wavelength horn is not as desirable as a full wavelength horn. Nor is a one-eighth wavelength horn as desirable as a one-quarter wavelength horn.

There also are several other types and designs of corner placement speaker enclosures that employ folded horns (generically referred to as "folded corner horns"), and each of these horns has a particular design that is unique with that particular model of horn. In one well known design, the low frequency driver radiates directly from an opening in the front of the enclosure, and is horn loaded at the back of the driver with a hyperbolic-exponential horn between six and seven feet long. The low frequency driver is located at the bottom of the speaker enclosure, and the horn leads from the bottom of the speaker enclosure upwardly to the top of the speaker enclosure and then is directed out of the front of the speaker enclosure through an opening in the top of the front panel.

One of the problems with this speaker is that the horn is of insufficient length to produce a desirably low horn cut-off frequency of 30-35 hertz. In this speaker, the cut-off frequency is calculated to be about 40 hertz, with the length of the horn being about one-fourth of the wavelength of the cut-off frequency.

Another problem with this horn is that there is relatively little fold to the horn — it simply runs from the bottom to the top of the enclosure — so in order to achieve proper horn length, it is necessary to make this enclosure unusually tall, on the order of fifty inches, or over four feet high. Aesthetically, a speaker of these dimensions is unsatisfactory in the average sized room, so the usefulness of this speaker is effectively limited to extra large rooms or auditoriums. Also, this speaker seems to have design limitations that impair the performance of the speaker.

One of the principal problems encountered in designing a speaker enclosure for home use is optimizing design characteristics so as to reach a suitable compromise between two continuously conflicting design parameters, one being the acoustic performance of the speaker and the other being aesthetic and financial considerations that place practical limitations on the size and the expense of any speaker. Heretofore it has not been possible to design a back loaded folded corner horn speaker employing a one-quarter wavelength horn (i.e., the length of the horn is one-fourth of the wavelength of the cut-off frequency of the horn) wherein excellent acoustic performance and a desirably low horn cut-off frequency have been achieved in a speaker of sufficiently modest cost and size to make the speaker acceptable for normal home use.

SUMMARY OF THE INVENTION

In accordance with the present invention, an improved high fidelity speaker of modest size and cost comprises a corner mounted speaker enclosure housing a low frequency driver that is direct radiating to the front and is back loaded at the rear by means of a folded corner horn that is fitted within the speaker enclosure. The length of the folded horn is one-fourth of the wave length of the cut-off frequency of the horn, and the outlet of the horn from the speaker enclosure is directed out of the back of the speaker into the corner of the room. From there the horn extends between the side panels of the speaker enclosure and the walls of the room to a mouth of the horn at the front of the speaker.

The speaker enclosure employed in the present invention comprises a vertical front panel that faces away from the counter and into the interior of the room and two vertical side panels that are attached to outside edges of the front panel and converge inwardly to a back portion of the speaker enclosure that fits into the corner of the room.

The interior of the speaker enclosure is divided into an upper horn compartment and a lower horn compartment, with a divider having an interior opening therein separating the two horn compartments. The path of the horn in the upper compartment comprises a generally inwardly converging spiral from the back of the low frequency driver to the opening in the divider. The lower compartment horn path comprises a generally outwardly expanding spiral running from the opening in the divider to a horn outlet at the back of the speaker facing the corner of the room. The sides of the speaker are spaced apart from the wall so that the space between the sides of the speaker and the walls form a final segment of the horn, with the area between the side panels of the speaker and the side walls of the room at the front of the speaker enclosure forming the mouth of the horn.

The horn of the present invention is hyperbolic-exponential in shape, employing a T factor of 0.5. The length of the horn is designed to be one-fourth of the wave length of the low frequency cut-off frequency of the horn (including the final segment between the speaker and the walls of the room). The length of this horn should be greater than seven and preferably at least eight feet for a high fidelity speaker. Ideally the length of the horn should be about nine feet. This produces a desirable cut-off frequency of about 30 hertz.

The horn is folded so that there are a minimum number of 180° bends in the horn path and so that there are a minimum number of parallel surfaces in the horn path, because both of these factors cause diffraction effects that adversely affect the performance of the horn.

The present invention also includes direct radiating mid-range and high frequency speakers, which are mounted in the front panel of the upper compartment of the speaker enclosure. The low frequency driver is an eight-inch driver and is electrically connected in the apparatus so as to be operating continuously through its full frequency range. The mid-range driver is connected to cut in at 800 hertz, and the high frequency driver is connected to cut in at 5,000 hertz.

These and other advantages and features of the present invention will hereinafter appear, and for purposes

of illustration but not of limitation, an illustrative embodiment of the present invention is described in detail below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view of the speaker of the present invention.

FIG. 2 is a schematic side view of the speaker of the present invention, showing schematically the audio paths provided in the present invention.

FIG. 3 is an exploded view of the speaker enclosure of the present invention.

FIG. 4 is a sectional view taken along line 4—4 of FIG. 2.

FIG. 5 is a sectional view taken along line 5—5 of FIG. 2, with the speaker being shown in position in the corner of a room.

FIG. 6 is a schematic electrical diagram showing the cross-over network of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings, a speaker 10 embodying the principals of the present invention is shown in perspective view in FIG. 1. Speaker 10 comprises a speaker enclosure 12 and three drivers 14, 16, and 18. Driver 14 is a low frequency driver or "woofer"; driver 16 is a mid-range driver or "squawker"; and driver 18 is a high frequency driver or "tweeter."

Speaker enclosure 12 is a generally triangular speaker enclosure commonly known as a corner speaker enclosure. Speaker enclosure 12 comprises a front panel 20 and side panels 22 and 24 which are attached to outside edges of front panel 20 and converge inwardly to a back corner 26 of the enclosure, so that the back of the enclosure fits into the corner of the room, with the side panels of the enclosure being spaced from the side walls of the room. A top 32 and bottom 37 enclose the top and bottom of the enclosure. Preferably, the front panel and top are formed of three-quarter inch veneer plywood and the remaining panels are formed of one-half inch veneer plywood.

Speaker enclosure 12 comprises an upper compartment 28 having a generally triangular horizontal cross section and a lower compartment 30, also having a generally triangular horizontal cross section. A divider 34 separates the upper and lower compartments. Divider 34 has a triangular opening 36 therein that provides a passage from the upper compartment downwardly into the lower compartment.

The speaker enclosure as a whole is about 24 inches wide, 12 inches deep, and about 27 inches high, with the upper compartment being about nine inches high and the lower compartment being about 18 inches high. Thus, the structure is easily small enough for home use in a conventional sized room.

Upper compartment 28 comprises a front panel 38 and side panels 40 and 42 which are joined together to form a triangular structure. Since the enclosure fits into the corner of a room, the shape of the triangle is approximately a 45° right triangle, with the 90° angle being formed opposite the corner of the room, so that the front panel is at a 45° angle with respect to the walls of the room. The triangle is not precisely a 45° right triangle, however, because the side panels are adapted to taper slightly away from the walls of the room as they run from the back corner of the enclosure to the front

of the enclosure to form a final expanding segment of a hyperbolic-exponential horn (as shown in FIG. 5).

Front panel 38 is provided with a baffle opening 44 for the low frequency driver on the left side of the panel (FIG. 3 orientation) and baffle openings 46 and 48 for the mid-range and high frequency drivers, respectively, on the right side of the panel. Front panel 38 is rectangular, and side panels 40 and 42 are attached to the front panel at the respective outside edges thereof and converge symmetrically inwardly to the back corner of the compartment.

The interior of upper compartment 28 is subdivided by a series of interconnected partitions into a triangular speaker compartment 50 for the low frequency speaker and a first or upper section of a hyperbolic-exponential horn 51 connected to the back of low frequency driver 14. Speaker compartment 50 is formed between side panel 40 and front panel 38 by means of a speaker compartment partition 52 which extends between side panel 40 and front panel 38. Speaker partition 52 and all other partitions employed in the upper and lower compartments of the speaker enclosure are vertically disposed and extend the entire height of each compartment. An opening 54 is formed in speaker compartment partition 52, and this opening constitutes the throat of horn 51.

Mid-range driver 16 and high frequency driver 18 are mounted outside of speaker compartment 50 and out of direct contact with throat 54 of the horn. The mid-range and high frequency speakers are direct radiating through the front of panel 38. The backs of these speakers are located in the path of the hyperbolic-exponential horn, but are acoustically isolated from any effective backloading of the speakers by the horn.

Horn 51 is formed in upper and lower compartments 28 and 30 by means of a series of vertically oriented partitions that extend the full height of each compartment so that the space between the partitions and the top and bottom of each compartment forms a sealed cavity or conduit. Horn 51 is designed as a hyperbolic-exponential horn, using a T factor 0.5. Horn 51 comprises a throat 54 leading into the speaker compartment 50 and a mouth 56 formed between the side panels of the lower compartment and the side walls of the room at the front of the speaker enclosure. The space between the side panels of the enclosure and the walls of the room thus forms an integral part of horn 51. As shown in FIG. 5, the side panels of the enclosure taper outwardly from the back of the enclosure to the mouth of the horn in accordance with the straight line approximation of the hyperbolic-exponential curve of the horn.

The length of the horn is selected to be one-fourth the wavelength of the cut-off frequency selected for the horn, which was selected to be 30 hertz. The wavelength of a 30 hertz signal is approximately 36 feet, so a one-quarter wavelength horn was selected to be approximately nine feet or 114 inches in length. The length of this horn is computed from throat 54 to mouth 56 and includes the distance between the side panels of the enclosure and the side walls of the room. The shape of hyperbolic-exponential horn 51, including the area of the throat and mouth, as well as the volume of speaker compartment 50 are all readily calculable in accordance with conventional mathematical formula and are dependent upon the cut-off frequency se-

lected for the apparatus and the characteristics of the driver selected for use in connection with the horn.

Although the length of the horn of the present invention is about nine feet, it is possible that satisfactory results could be obtained within the spirit and scope of the present invention by selecting a higher cut-off frequency for the horn and using a correspondingly shorter horn. For good bass performance, however, the cut-off frequency selected should be 40 hertz or less and preferably 35 hertz or less. The minimum horn length roughly corresponding to 40 hertz and 35 hertz signals are about seven and eight feet respectively. Therefore, horn length should in any case be greater than seven feet, should preferably be at least eight feet, and ideally should be nine feet.

In laying out the horn path to be employed in the speaker enclosure of the present invention, several important design criteria were followed in order to minimize any distortion effects by the folded path of the horn. One important design criteria is that there be a minimum number of 180° turns or bends in the horn. Another criteria is that there be a minimum number of parallel partition surfaces in the horn. When surfaces are parallel and there are a substantial number of 180° turns, the performance of the horn is adversely affected.

The path followed by the horn in the upper compartment of the enclosure is generally in an inwardly converging spiral. The path starts at throat 54 and extends perpendicularly away from speaker compartment partition 52. Partitions 58 and 60 form the side walls of this first segment 62 of the horn. The outer end of segment 62 is then connected to a segment 64 of the horn that extends along the outer side of partition 60 back to speaker compartment partition 52. Partition 65 forms the other side of segment 64. The outer end of segment 64 is connected to a third segment 66 of the horn which leads from the speaker compartment partition along side panel 40 away from the speaker compartment partition to the back corner of the upper compartment. A partition 67 forms the inner side wall of segment 66, and a short section of partition 69 joins partitions 67 and 65 at the ends thereof adjacent partition 52. This latter partition provides a gradual bending of the horn around this corner and avoids a sharp 180° turn.

The outer end of segment 66 is connected to a fourth segment 70 that leads from the outer end of segment 66 along side panel 42 to the corner formed by side panel 42 and front panel 38. Partition 71 forms the inner wall of this fourth segment, and this partition is attached to the ends of partitions 67, 65, and 58.

The path of the horn then turns at the outer end of the fourth segment, and a fifth segment 74 runs along front panel 38 to speaker compartment partition 52, with a separate partition 73 forming the inner side wall of fifth segment 74. The outer end of fifth segment 74 is then connected to an open upper section 76 in the upper compartment, which is formed by partitions 58, 71, and 73. This open upper section is directly over and mates with opening 36 in divider 34.

The horn then leads downwardly through divider 34 into a corresponding open lower section 78 in lower compartment 30 of the speaker enclosure. Open lower section 78 forms the beginning of the lower or second section of horn 51. This second section of the horn follows a generally outwardly expanding spiral and ema-

nates from the enclosure directly into the corner of the room at the back of the lower compartment.

Open lower section 78 is bordered by vertical partitions 79, 81, and 83, with an open space being formed between the end of partition 79 and partition 83 so as to form the outlet of open section 78. The outlet of section 78 is connected to a sixth segment 80 of the horn with one side of sixth segment 80 being formed by partition 79 and the other side of the segment being formed by partition 85. Partition 85 is connected at one end to the end of partition 83 and at the other end to a short partition 87, which is positioned so as to properly direct the output of the horn directly into the corner of the room. Partition 87 is in turn connected to a side panel 89 of the lower compartment. Side panel 89 fits directly under side panel 42 in the manner shown in FIG. 1.

The outer end of the sixth segment 80 is connected to a seventh segment 82 which runs between side wall 89 and partition 81 to the corner formed between side panel 89 and front panel 92 of the lower compartment. An eighth segment of the horn 84 leads from the outer end of seventh segment 82 along front panel 92 to a partition 95 extending between the other side panel 96 of the lower compartment and front panel 92. The outer end of eighth segment 84 of the horn is connected to a ninth segment 86 of the horn which runs from the outer end of the eighth segment to a horn outlet 88 at the back of the lower compartment. One side of this ninth segment is formed by partitions 85 and 87, and the other side of the segment may be formed by panels 97 and 99, with panel 99 being formed so as to direct the output of the horn directly into the corner of the room. To simplify the subject structure, it would be possible to eliminate panels 97 and 99 and have the outer side of ninth segment 86 formed by side panel 96 of the enclosure. It would also be possible to eliminate the extra partition 87 and extend partition 85 all the way into side panel 89. These simplifications would be at the expense of some directional advantages.

At the horn outlet 88, the audio output of the horn has expanded in a hyperbolic-exponential fashion to a size almost equal to the mouth area of the horn. The horn outlet, however, is not the mouth of the horn, as the audio output emanating from the horn outlet continues its path through a tenth segment 98 formed between the side panels of the enclosure and the walls of the room. The audio output emanating from horn outlet 88 is propagated toward the corner 100 of the room and is reflected back toward the front of the enclosure by means of a deflector plate 102 that is spaced a predetermined distance away from the horn outlet and fits into the corner of the room at a 45° angle. Deflector plate 102 is connected to the back of the lower compartment 30 of the speaker enclosure by means of horizontal mounting plates 104 and 106 at the top and bottom of the deflector plate.

The audio output emanating from horn outlet 88 is deflected to the front of the enclosure between the side panels of the lower compartment and the side walls of the room. As shown in FIG. 5, side panel 96 is formed so that it continues to expand as it runs opposite side wall 108 of the room, and side panel 89 tapers similarly away from wall 110 as it runs from the back of the enclosure to the front of the enclosure. Mouth 56 of the horn is formed at the front of the enclosure between side panels 96 and 89 and side walls 108 and 110, re-

spectively. This enclosure thus produces a horn that is longer and occupies a greater area than the enclosure itself.

The drivers and electrical crossover network of the present invention are shown schematically in FIG. 6. Low frequency driver 14 should be a 6 to 12 inch driver having good transient response characteristics. The driver is operated over its full frequency range and larger speakers or speakers with poor transient response are unsatisfactory in such an application. Conversely, most drivers smaller than six inches are incapable of producing sufficient bass response to be used as a low frequency driver. In the present invention an eight inch driver is deemed most satisfactory, and this driver is connected in the enclosure to operate over its full frequency range. It is customary in most speaker enclosures to choke or filter the low frequency speaker so that it will not reproduce signals above a certain cut-off frequency. However, by using a relatively small driver with good transient response, it is not necessary to choke the low frequency speaker. This avoids possible adverse effects introduced by choking and provides an important reinforcement of the mid-range signal of the speaker. A C.T.S. eight inch driver (Model No. 8E8540 custom design) works well as a woofer in the present invention.

The other drivers found to be satisfactory are a C.T.S. three and one-half inch mid-range (Model No. TS7171); and a Norelco Tweeter (Model No. AD0160/T8). Each of these drivers is connected to work from its low cut-off point to its maximum high frequency capability. Preferably, the mid-range cuts in at about 800 cycles and the tweeter cuts in at about 5,000 cycles. In order to achieve these results, the crossover network requires only non-polarized capacitors employed as high pass filters. These capacitors are connected in parallel configuration, with a constant K, quarter section network, with a roll-off of 6 db per octave. The preferred embodiment of the present invention employs a capacitor 112 of 15 mfd and a capacitor 114 of four mfd. The individual levels of the mid-range and high frequency drivers are adjustable by means of L-pads 113 and 115, respectively.

Several important advantages are achieved by the speaker of the present invention. One of the principal advantages of the present invention is an improved bass response achieved from components costing a modest amount of money. The eight inch woofer maintains fundamental radiation through the horn down to about 35 hertz, while the upper frequency response remains extremely flat to 22 kilohertz. Also, very low harmonic distortion levels are maintained throughout the pass-band, most notably in the crucial bass region through the use of horn loading.

Another advantage of the present invention is that the fidelity and efficiency of a one-quarter wave-length horn is achieved within size and cost limitations applicable to home speakers. The speaker is less than three feet high (actually about 27 inches high), about 24 inches wide, and about 12 inches deep. Thus the volume occupied by the speaker is less than three cubic feet and actually is only about two and one-fourth cubic feet, which is much smaller than other folded corner horns having much shorter horns. Moreover, the cost of the speaker of the present invention is much lower than the cost of other folded corner horn speakers presently available commercially.

It should be understood that the embodiment described herein is merely exemplary of the preferred practice of the present invention and that various modifications and changes may be made in the arrangements and details of construction of the embodiment described herein without departing from the spirit and scope of the present invention.

The embodiments of the invention in which an exclusive property of privilege is claimed are defined as follows:

1. A back loaded, folded corner horn speaker comprising:

a corner speaker enclosure having a front and a back and an open interior and including:

a front panel having at least one baffle opening therein;

a pair of side panels connected to opposite side edges of the front panel and converging inwardly therefrom to the back of the speaker enclosure, said back comprising a horn outlet therein, said side panels being formed such that when the speaker is placed in the corner of a room with the side panels facing the walls of the room, said side panels are spaced from the walls of the room such that the space between the side panels and the walls forms the final segment of a folded horn fitted in the enclosure; and

a top and a bottom enclosing open ends of the speaker enclosure;

a low frequency driver having a front and back and mounted in the baffle opening such that the front of the low frequency driver radiates directly outwardly from the speaker enclosure into the room and the back of the low frequency driver radiates into the interior of the speaker enclosure;

a folded hyperbolic-exponential horn fitted in the interior of the speaker enclosure so as to back load the back of the low frequency driver, said horn extending from a horn throat acoustically connected to the back of the low frequency driver to the horn outlet at the back of the speaker enclosure, said horn thereafter extending through a final segment of the horn formed along the outer surfaces of the side panels to a horn mouth at the front of the speaker enclosure, the length of said horn being approximately one-fourth of the wavelength of the low frequency cut-off frequency of the horn;

the interior of the speaker enclosure comprising upper and lower compartments that are separated by a horizontal divider, with a divider opening in the divider forming a passage from the upper to the lower compartment;

the upper compartment comprising the baffle opening and the driver and a first section of the horn formed by a series of interconnected partitions extending between the top and the divider, said first section of the horn extending from the throat connected to the back of the low frequency driver to the divider opening leading to the lower compartment; and

the lower compartment comprising the horn outlet and a second section of the horn formed by partitions extending between the divider and the bottom, said second section of the horn extending from the divider opening to the horn outlet of the enclosure.

2. A back loaded, folded corner horn speaker as claimed in claim 1 wherein:

the divider opening is located in an interior portion of the divider;

the path of the first section of the horn in the upper compartment is a generally inwardly converging spiral leading from the back of the driver at the front panel to the divider opening; and

the path of the horn in the lower compartment is a generally outwardly expanding spiral leading outwardly from the divider opening in the interior of the compartment to the horn outlet at the back edge of the speaker enclosure.

3. A back loaded folded corner horn speaker as claimed in claim 2 wherein the horn path formed by the partitions comprises a plurality of individual interconnected segments, each having a straight axis and expanding in a generally straight line approximation of a hyperbolic-exponential curve.

4. A back loaded, folded corner horn speaker as claimed in claim 3 wherein no more than two adjoining horn segments in the enclosure are immediately adjacent each other so as to share a common partition.

5. A back loaded, folded corner horn speaker as claimed in claim 3 wherein the horn is formed so that there are no more than two bends of approximately 180° in the horn within the enclosure.

6. A back loaded, folded corner horn speaker as claimed in claim 3 wherein the partitions are positioned so that separate partitions forming adjoining segments are not parallel.

7. A back loaded, folded corner horn speaker as claimed in claim 1 wherein the horn has a flare parameter T of approximately 0.5.

8. A back loaded, folded corner horn speaker as claimed in claim 1 wherein the length of the horn is no less than about 7 feet.

9. A back loaded, folded corner horn speaker as claimed in claim 8 wherein the length of the horn is at least 8 feet.

10. A back loaded, folded corner horn speaker as claimed in claim 9 wherein the length of the horn is approximately 9 feet.

11. A back loaded, folded corner horn speaker as claimed in claim 1 wherein the horn has a cut-off frequency of less than 40 hertz.

12. A back loaded, folded corner horn speaker as claimed in claim 2 wherein the horn has a cut-off frequency of about 30-35 hertz.

13. A back loaded, folded corner horn speaker as claimed in claim 8 wherein the speaker is less than 3 feet high.

14. A back loaded, folded corner horn speaker as claimed in claim 9 wherein the height of the speaker from top to bottom is no more than about 27 inches.

15. A back loaded, folded corner horn speaker as claimed in claim 14 wherein the volume of the speaker is no more than about 3 cubic feet.

16. A back loaded, folded corner horn speaker as claimed in claim 2 wherein the low frequency driver has sufficient transient response characteristics to satisfactorily reproduce audio signals in the middle range of frequencies.

17. A back loaded, folded corner horn speaker as claimed in claim 1 wherein the low frequency driver is a 6 to 12-inch diameter driver.

11

18. A back loaded, folded corner horn speaker as claimed in claim 17 wherein the low frequency driver is an 8-inch driver.

19. A back loaded, folded corner horn speaker as claimed in claim 1 and further comprising a direct radiating mid-range driver and a direct radiating high frequency driver mounted in separate baffle openings in the front panel.

20. A back loaded, folded corner horn speaker as claimed in claim 19 wherein the low frequency driver is an 8-inch driver.

21. A back loaded, folded corner horn speaker as claimed in claim 20 wherein the 8-inch driver operates through its full frequency range, the mid-range driver is connected so as to cut in at about 800 hertz and operate through its full high frequency range, and the high frequency speaker is connected so as to cut in at 5,000 hertz and operate through its full high frequency range.

22. A back loaded, folded corner horn as claimed in claim 3 wherein:
the upper compartment comprises:

- a triangular speaker compartment formed in a front corner of the upper compartment between one side panel of the compartment and the front panel, the baffle opening being formed in the front panel of said speaker compartment, a vertical speaker compartment partition forming the third side of the speaker compartment and extending between the first side panel and the front panel, the horn throat opening being formed in the speaker compartment partition;
- a first horn segment extending from the throat to an outer end away from the speaker compartment in a direction generally perpendicular to the speaker compartment partition;
- a second horn segment leading from the outer end of the first horn segment to an outer end adjacent the speaker compartment partition in a path that runs adjacent the first segment;
- a third segment connected to the outer end of the second segment and extending away from the speaker compartment partition to an outer end adjacent the back corner of the enclosure;
- a fourth segment extending from the outer end of the third segment along the second side panel of the compartment to an outer end adjacent the corner of the compartment formed by the second side panel and the front panel;
- a fifth segment extending from the outer end of the

12

fourth segment along the front panel of the compartment to an outer end adjacent the speaker compartment partition; and

an upper open section formed between the first, fourth, and fifth segment of the horn, said upper open section having a triangular horizontal cross section and opening on one side thereof into the outer end of the fifth segment;

the divider opening mates with the upper open section;

the lower compartment comprises:

a lower open section that mates with and is positioned immediately below the upper open section and the opening in the divider, said lower open section being triangular in horizontal cross section and being formed by three partitions, an outlet opening being formed in one of the partitions;

a sixth segment connected to the outlet opening in the lower open section and running along one of the partitions surrounding the lower open section to an outer end at the end of said partition;

a seventh segment connected to the outer end of the sixth segment and running between a second of the partitions surrounding the lower open section and one of the side panels of the lower compartment, said seventh segment terminating at an outer end at the front panel of the lower compartment;

an eighth segment connected to the outer end of the seventh segment and running along the front panel to an outer end adjacent the corner of the compartment formed by the front panel and the other side panel;

a ninth segment extending from the outer end of the eighth segment to the horn outlet at the back of the enclosure;

a vertically disposed corner deflection plate means is connected to the lower compartment outside the enclosure so as to face directly into the horn outlet, said deflection plate means being adapted to deflect audio output emanating from the horn outlet into the space between the respective side panels of the enclosure and the side walls of the room; and

the final segments of the horn formed adjacent the outer surfaces of the side panels of the enclosure extend from the horn outlet to the mouth of the horn at the front of the enclosure.

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