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Hancock

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

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[51] **Int. Cl.²** **H05K 5/00**

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

[56] **References Cited**

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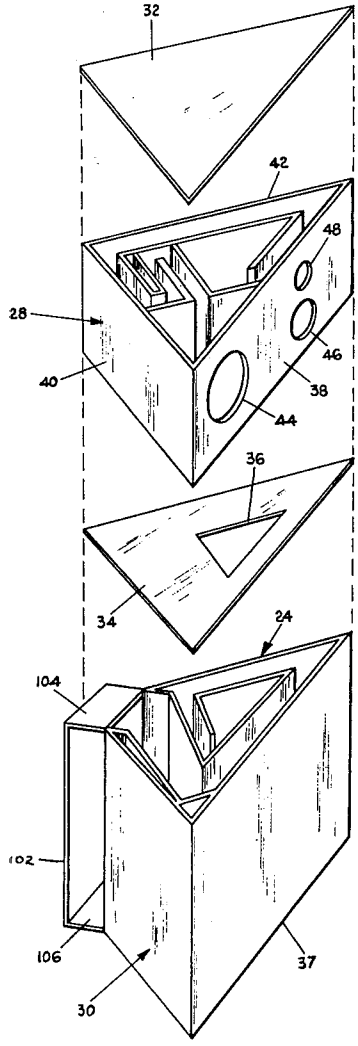
[57] **ABSTRACT**

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



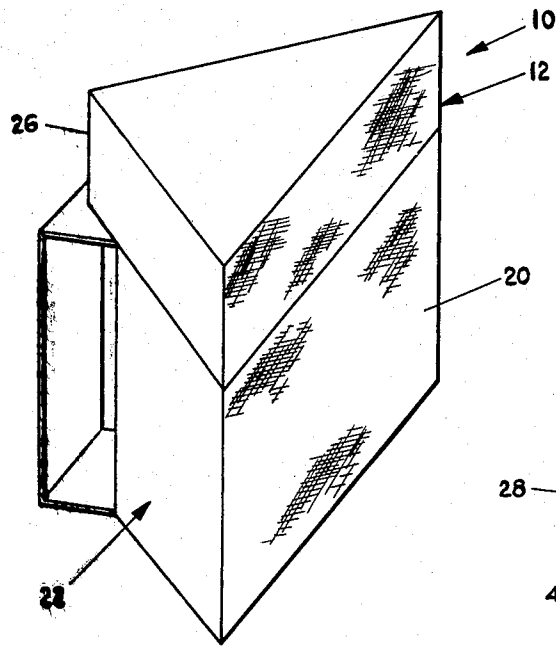


FIG. 1

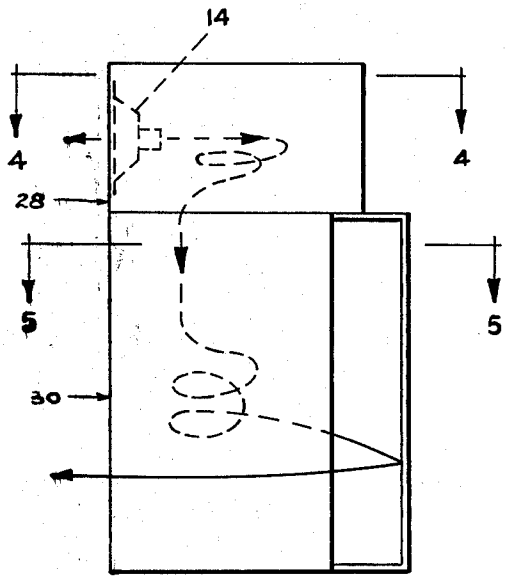


FIG. 2

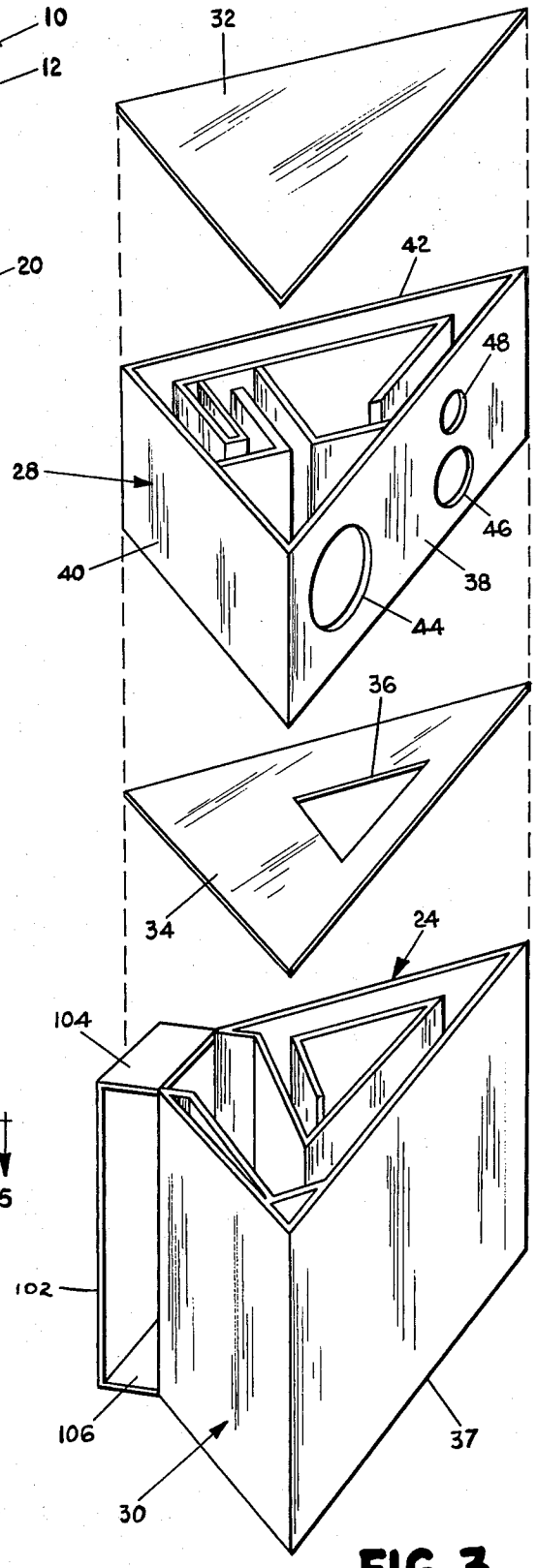


FIG. 3

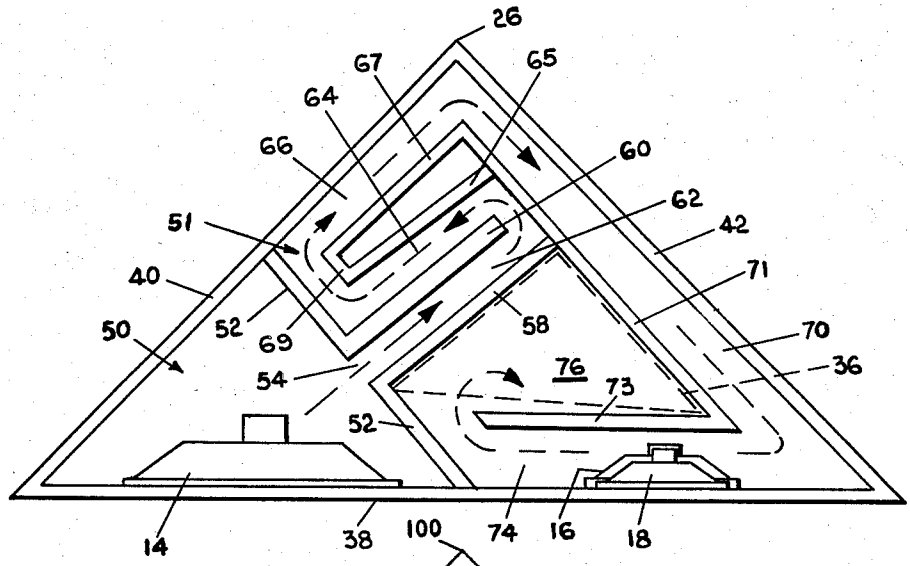


FIG. 4

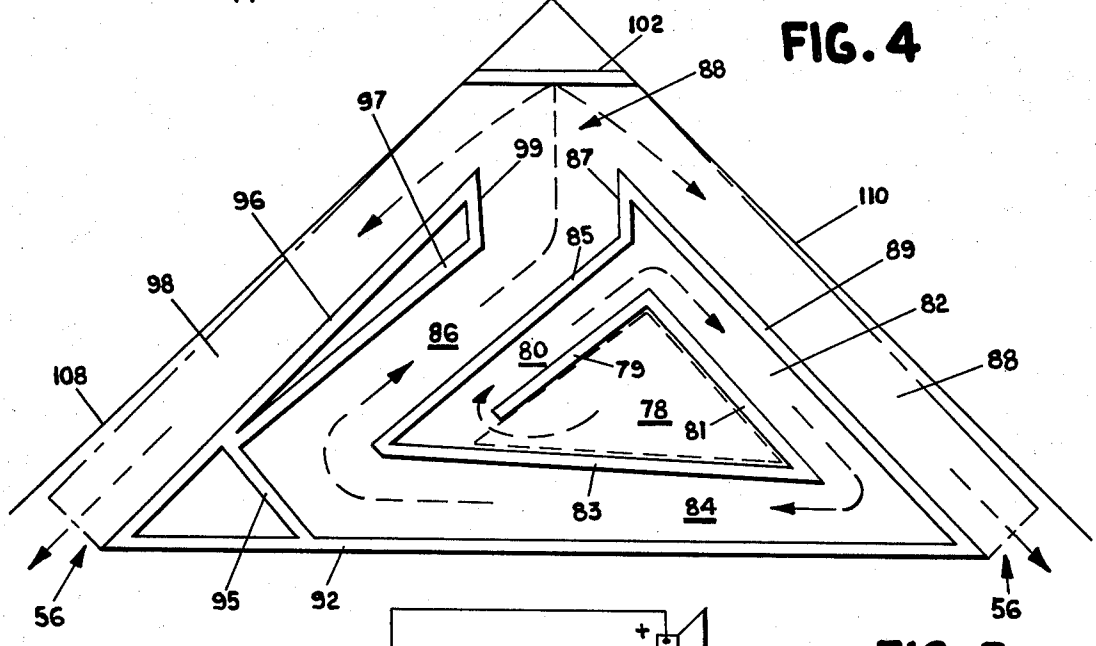


FIG. 5

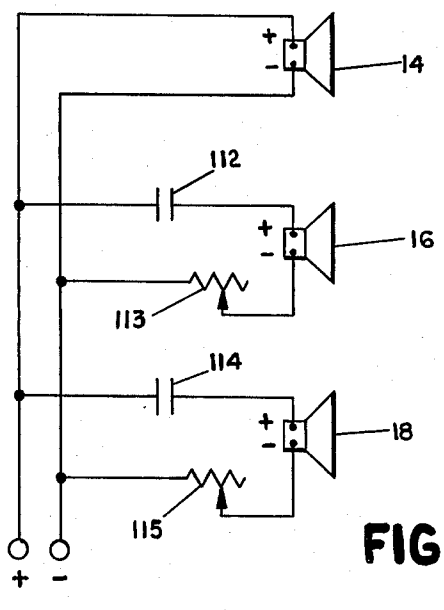


FIG. 6

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 usefullness 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 foldec 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 mathmatical formula and are dependent upon the cut-off frequency selected 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,** respectively. 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 passband, most notably in the crucial bass region through the use of horn loading.

Another advantage of the present invention is that the fidelity and effeciency 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 priviledge 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.

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 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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