loudspeaker systems

klipsch®

loudspeaker systems

From the rafter-rocking sound of a symphony orchestra or brass band to the intimacy of a string quartet or soloist, the entire palette of musical colors are reproduced through Klipsch loudspeaker systems just as you would hear them in the original performance.

Throughout their extended range — more than the human ear can hear — Klipsch loudspeaker systems respond with definition of tone and freedom from distortion. The bass is true without boom, the treble accurate without artificial "hi-fi" effects, the middle range precise without muddiness. For Klipsch systems are more than just "high fidelity" speakers — they offer the nearest approach to true sound reproduction yet developed.

The spectacular sound effects sometimes associated with "high fidelity" — exaggerated bass and over-accentuated trebles — are not fidelity, but are distortions of the original sound. If reproduced music is to be as nearly identical with the original as possible, the

BIBLIOGRAPHY

Optimum speaker size, effects of spacing from walls and floor, basic speaker design, evaluation of stereo geometry (accuracy of localization) and other subjects are reported in a series of technical papers by Paul W. Klipsch and a few significant papers by others. A bibliography is available on request and reprints at nominal cost.

creation of sound which is spectacular or sensational must be left to the recording artist — not to the sound reproducing system. For if a loudspeaker system is to have fidelity, it must not produce new sounds of its own — it must unobtrusively re-produce the original. And that is the one thing Klipsch loudspeaker systems have been designed to do.

The KLIPSCHORN and other Klipsch speakers are made by a small group of dedicated engineers and craftsmen directly supervised by Paul W. Klipsch. They are sold by a small group of dedicated dealers. It may be a slight task to find your area dealer but it will be worth the effort. You'll find him helpful, informative, fair and with good demonstration facilities.

Klipsch-designed horns, folded and straight axis, offer smooth nine-octave response

THE ACCURATE REPRODUCTION OF SOUND has been a major objective ever since Thomas Edison first attached a tin horn to his primitive phonograph. In this simple experiment, Edison was nearer to the true solution of the problem than even he realized, for the horn-type loudspeaker has proved the best yet developed.

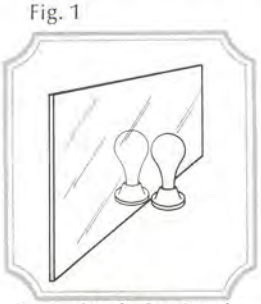
For years scientists have known of the high efficiency of the exponential horn, designed according to a formula of expanding cross sections. Exponential horns have been designed which can handle the big 32-foot wave lengths of the deep organ pipes. The difficulty though is that one of these horns, to do the job, must be as large as a modern living room.

To this important problem, Paul W. Klipsch gave his attention in 1940 and after years of research, developed the KLIPSCHORN corner horn loudspeaker system. This system has the required air column for reproducing the deepest notes and steepest wave fronts, yet demands but small space in a living room. It achieves this by making the corner walls of the room part of an intricately folded horn.

Klipsch recognized that the room corner afforded an advantage which made possible the reduction in size of the horn while still providing a sufficient air column for low "C" on the organ. The advantage was that the three surfaces of corner walls and floor have a mirror effect, producing reflections of sound waves and multiplying their effective length. The combination of corner horn and corner mirror effect made it practical for the first time to build a loudspeaker system of moderate size which would reproduce audibly the lower octave and a half of the nine octaves we are able to hear.

The corner-horn design also offers improved reproduction of middle range and high notes as well as the bass notes. In these upper ranges sound travels in straight lines from its source. A listener, to hear the whole of recorded music in proper balance, must be within direct range of the horns reproducing the higher frequencies. When speaker systems are placed anywhere except in corners, there are usually large dead areas in the room which are never reached by many of the higher frequencies, or at best are reached only by weakened, distorted reflections of them from walls and furniture. Only corner placement affords optimum distribution of treble notes throughout the room without hot spots, dead spots, or room resonance.

Fig. 1



To visualize the function of a room corner as part of a speaker system, first picture a lamp and a mirror so disposed that the mirror image doubles the amount of light in the wanted region.

Fig. 2

Next, imagine a horn speaker with one flat side against a mirror wherein the radiating area is effectively doubled and consequently enabled to handle longer wave lengths.

Fig. 3

Finally, look at the actual speaker in the corner of a room and imagine the appearance if the walls and floor were optical mirrors; there would be three mirror images of the real speaker above the floor and four more below the floor. This is how the KLIPSCHORN system handles 32-foot wave lengths.

klipschorn® *Corner Horn Loudspeaker System*

Fig. 4

CREATED FOR THOSE WHO APPRECIATE THE FINEST, the KLIPSCHORN system has been produced without regard for expense to offer the closest possible identity with original sound. In it we use three carefully matched horns which complement each other. We have settled on the use of these three horns with their individual driver units because tests show that this combination affords the smoothest response of any combination tested. And we have tested practically every principal make of driver, foreign as well as domestic.

If the addition of more speakers would improve reproduction, we would add them. If driver units were available which are superior to the ones we use, we would readily substitute them. If the insertion of controls would increase fidelity, we would insert them. But we have found that these extras do not contribute to the fidelity of reproduction — they merely create artificial "hi-fi" effects which are distortions of the original.

The purchase of a KLIPSCHORN is a final one. Of the thousands in the world, the used market is nil. There is no way to improve the fundamental design of these speakers so people keep them.

THE HORN PRINCIPLE is most simply explained by comparison with a piston pump. A piston, sloshing up and down in the middle of a lake by itself, fails as an effective pump. An open-cone speaker, sloshing the air in a room, fails as a sound generator especially at wave lengths larger than the diameter of the cone. But put a cylinder around the piston and it becomes effective as a pump; properly match a horn to the vibrating diaphragm and it becomes an effective speaker. The resulting increase in efficiency minimizes distortion. The advantage of utilizing a corner as part of the horn is that it provides a large radiating area to propagate long wave lengths.

CORNER HORN DESIGN employs reflection of sounds from the walls and floor (or ceiling) of a corner. Reflections produced by two walls double the wave length capability, adding an octave to the bass range. And reflections from the floor or ceiling increase the range by still another half octave.

KLIPSCHORN SYSTEMS ARE DESIGNED AND TESTED FOR UNIFORM RESPONSE UNDER TYPICAL CONDITIONS. The three horns in each are properly balanced in the Klipsch laboratory, requiring no adjustment by the owner. Where unusual room acoustics present a problem, it is recommended that the room be corrected with the addition of draperies, carpeting or other absorbent material. In occasional instances, changing the speaker from one corner to another is advantageous.

Any attempt to insert "presence" controls, pads, or attenuators in a loudspeaker system would merely introduce distortion. Their use would be comparable to asking the recording artists to play extra loud or extra soft within a specified range of notes.

KLIPSCHORN is a Registered Trade Mark of Klipsch & Associates, Inc.

Klipschorn® response is more extended, more uniform—and less distorted—than the response of any other speaker.

FULL FREQUENCY RANGE

Overall response of system: less than 10 decibels down at 32.7 Hz; less than 8 decibels extreme variation to 19 kHz. Fundamental tones radiated down to 25 Hz. Output approximately 10 decibels higher than the best direct radiators and 20 decibels higher than some typical systems.

INDIVIDUALLY TESTED

The listening test, especially involving comparison with original sound, is accepted as final, although sound pressure curves are relied on as a research aid. Critical listeners are asked not merely, "Does it sound good?," but are asked to compare recorded sound, played through a Klipsch loudspeaker system, with the original sound, ranging from solo violin to full symphony orchestra. Usually, from one half to three quarters of the audience is not able to distinguish the difference.
Each speaker is individually tested under the personal supervision of Paul W. Klipsch.

ADAPTABLE TO MANY USES

The KLIPSCHORN speaker system, while designed primarily for home use, is also ideal for public halls, schools, churches, libraries, studios, audition rooms, and laboratories.

RECOMMENDED ASSOCIATED EQUIPMENT

The KLIPSCHORN reproduces everything fed into it by the amplifier and sound source. This makes it imperative that equipment of the highest quality be used. Freedom from distortion and actual power output (undistorted) at 30 Hz is more important than published power rating. We have heard superior sound from both tube and transistor-type equipment. The manufacturer's design, skill, and integrity contribute more to amplifier quality than the particular types of components used in construction.

LOW OBSOLESCENCE

The basic structure of the KLIPSCHORN sound reproducer is fundamentally correct; improvements in detail will undoubtedly occur, but the basic system need never be changed. With possible future changes in drive units, the KLIPSCHORN system may be kept up to date for a lifetime. Conversion kits are available to afford modern performance from early models of serial number 14 and higher.

PLACE IN BEST AVAILABLE CORNER

For best results, install your KLIPSCHORN loudspeaker in a corner affording the most unobstructed wall space. Keep the corner of the top pushed into the corner of the room wall. Flanking draperies are entirely permissible as long as they leave sound passageways clear. It is recommended that nothing be set on top of the system such as vases, bric-a-brac, ashtrays, etc. because they may rattle.
An artificial corner may be built to accommodate the KLIPSCHORN, and the problems of difficult rooms have often been solved with carefully designed artificial corners. These can frequently be constructed using a room divider or bookshelf against a wall so as to reflect the rear wave from the other side of the bass horn. Natural corners always provide maximum efficiency, but temporary problems can be solved with ingenuity.

NO KITS OR DRAWINGS

KLIPSCHORN speakers are available as complete systems and also as components. Kits and drawings are *not* available.

OVERALL DIMENSIONS AND SHIPPING WEIGHTS

Diagram shows dimensions of the Style B. Style C is 128.3 cm. (50½") high and Style D, the decorators' model, is 126.4 cm. (49¾") high. Baseboard cutout may be specified up to 18 cm. (7½"). Shipping weight, 82 to 109 kg. (180 to 240 lbs.)
Plywood Construction

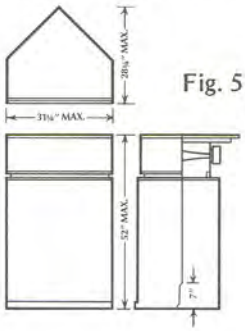


Fig. 5

klipschorn®

Corner Horn Loudspeaker System

Cutaway model of KLIPSCHORN *system shows exponential sound passages and back air chambers of bass horn, and section of mid-range horn. The high frequency horn and driver can be seen over or on top of the mid-range horn.*

Fig. 6

Three matched horns

THE BASS HORN, of folded corner horn design, has an air column sufficient to reproduce, without distortion, the lowest note on most pipe organs and it maintains flat response up to the top of its assigned range, about G above middle "C" in the music scale. No other bass speaker of comparable size has ever been able to achieve this. Miniaturized bass speakers have been attempted, but so far no one has invented a miniature 32-foot wave length.

In design the bass horn is substantially exponential in expansion, actually comprising a series of wedge-shaped spaces which approximate the exponential expansion to a very close degree.

ACOUSTIC DATA

Nominal exponential flare rate, 40 Hz, deviation from exponential rate less than 0.01 wave length; lower and upper effective cutoffs with proper drive unit, 28 and 550 Hz, upper crossover used, 400 Hz; peak conversion efficiency is over 80%, trough efficiency over 50%; available acoustic power from qualified 10 watt amplifier is over 3 watts. A very important design consideration is the short radii of bends in the horn, permitting propagation of wave lengths as short as 18 inches corresponding to frequencies as high as 750 Hz, making the recommended crossover of 400 Hz conservative. Only by twin passages can this be accomplished. Attempts in 1940 to achieve the results by a single sound path proved futile. The throat is the upper limiting design element.

CONSTRUCTION

Rigidly braced plywood, grade A-B (marine grade in marine models), is assembled with nearly 2 gross of screws, plus other fastenings, with high grade adhesives on all structural joints. The system is free from air leaks, a mandatory requirement for peak-free response, and extremely solid, more than fulfilling the basic requirements that a horn be "a reasonably rigid boundary for an air column" (A. G. Webster, inventor of the exponential horn).

FINISHES AND SHIPPING WEIGHT

Available in decorators' model (unfinished fir) or theater black. Shipping Weight 110-170 lbs.

THE MID-RANGE K-400 HORN, successor to the KLIPSCH sectoral-type K-5 Series horn (first of its type; U. S. Pat. 2,537,141 and widely copied) offers a wider frequency range, lower peak-trough ratio and better polar response. Its use has permitted lowering the first crossover from 500 Hz to 400 and raising the upper crossover from 5,000 to 6,000 Hz. With the K-55-V driver the peak-trough limits are easily held to 6 db (reference level plus or minus 3 db). No other mid-range system type tested here has exhibited less than 10 db peak-trough ratio.

THE HIGH FREQUENCY SPEAKER K-77 is a horn-type tweeter carefully selected for type and quality, mounted and ensemble-tested by the manufacturer. It gives natural rendering of tones from high "G" to beyond the limits of hearing, without artificial exaggeration or peaking of the ultra high frequencies. Tweeters in general involve such small dimensions and correspondingly small tolerances that variations in output, between units of the same production lot, will exceed 10 dB. After selecting a type for average performance, power capacity, polar pattern, acceptance is based on testing the entire delivered lot by plotting a response curve of each unit with level calibration and retaining the machine-run X-Y plot for reference. A Bruel & Kjaer half-inch microphone flat to 40 kHz is used to feed a KLIPSCH LOGARATOR (Patented). The entire microphone-plotter system is reliably flat to the edge of the 20 kHz graph paper.

ACOUSTIC DATA

The tweeter driver and horn K-77 exhibit an overall measured pressure variation of only 8 decibels from 5 kHz to 19 kHz, exhibiting less pressure variation and lower distortion than any other tweeter tested.

Fig. 7

belle klipsch®

Loudspeaker

A domesticated version of LA SCALA theater speaker, the BELLE KLIPSCH has the same basic design. To make it more suitable for home use, dimensions have been modified and fine hardwoods used in its construction.

The entire output spectrum including the bass is horn-loaded, giving the BELLE KLIPSCH only about one tenth the total distortion of direct radiator speakers of comparable size and equal output. That, plus preservation of tonal quality from whispering low levels to ear-splitting high levels, puts it in a class with the KLIPSCHORN.

The BELLE KLIPSCH may be used in any location in two or three speaker stereo arrays with any Klipsch speakers, or in a monophonic system. It is ideal as the center speaker with flanking KLIPSCHORNS in a 3-speaker array.

The BELLE KLIPSCH employs the same drive components as the KLIPSCHORN. The midrange horn is slightly smaller than that of the KLIPSCHORN and the woofer is shorter and is folded into two paths instead of three as in the KLIPSCHORN.

DIMENSIONS

90.5 cm. (35 5/8") high, including base, 76.5 cm. (30 1/8") wide, 47.6 cm. (18 3/4") front-to-back.

Plywood Construction

Specifications on request.

BELLE KLIPSCH is a Registered Trade Mark of Klipsch & Associates, Inc.

cornwall®

Loudspeaker

A general-purpose speaker for use in a corner or where a corner is not available, the CORNWALL employs a horn tweeter, horn mid-range and ported bass. It is especially valuable for stereo when used in conjunction with the KLIPSCHORN.

The ideal wide-stage stereo array calls for the CORNWALL as center speaker between flanking KLIPSCHORN corner-horn speakers. However, the CORNWALL may be used in any or all positions in a two-or-three-speaker stereo array or in a monophonic system.

The CORNWALL employs the same drive components as the KLIPSCHORN. The mid-range horn is shorter with the cutoff frequency higher between woofer and midrange than that in the KLIPSCHORN. The Woofer is a ducted port.

Risers are available at extra cost.

DIMENSIONS

90.8 cm. (35 3/4") high, 64.8 cm. (25 1/2") wide, 39.4 cm. (15 1/2") front-to-back.

Plywood Construction

Specifications on request.

Fig. 8 *MODEL C in preferred vertical position illustrated with the optional riser.*

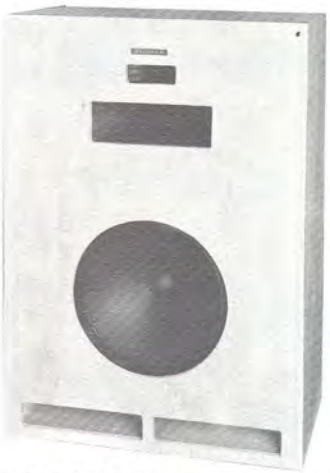


Fig. 9 *CORNWALL C-D Decorators' Model*

CORNWALL is a Registered Trade Mark of Klipsch & Associates, Inc.

Fig. 10

Fig. 11

HERESY is a Registered Trade Mark of Klipsch & Associates, Inc.

heresy®

Loudspeaker

The widest range with the lowest distortion of any speaker of its size makes our Model H the preferred choice where space is not available for a larger speaker. This speaker affords the same smoothness of response as the KLIPSCHORN except for the bass cutoff which is 1/3 octave higher. Horn loaded throughout its treble spectrum, it maintains low diaphragm amplitudes and velocities necessary for low modulation distortion. It is compatible with KLIPSCHORNS when used in stereo arrays.

Although the woofer cavity is only 4.5 liters (1.6 ft.^{3}), the response, range and efficiency equal or exceed systems of considerably larger size.

The size and shape make it well adapted for over-proscenium location in auditoriums as well as in rooms of limited size for home use. Its portability appeals to musicians and theatrical groups.

The HERESY is supplied with network balanced either for use as a primary speaker or as a center stereo speaker. In the Brussels Worlds Fair stereo system, a Model H was used as bridged center speaker with flanking KLIPSCHORNS.

The midrange and tweeter drivers in the HERESY are the same as those used in the KLIPSCHORN. The midrange horn is shorter and thus has a higher cutoff frequency between woofer and midrange. The woofer is a 1.5ft.^{3} total enclosure.

DIMENSIONS: 54.3 cm. (21 3/8") high without base; 54.8 cm. (22 3/8") high with base; 39.5 cm. (15 1/2") wide, 33.4 cm. (13 1/8") front-to-back.

Plywood Construction

la scala®

Theatre and Commercial System

Designed for theatre use, LA SCALA is a wide-range loudspeaker, adaptable for custom installation or as a portable unit for professional musicians.

LA SCALA may be used in a corner or along a wall. It is a full 3-way horn system of the most compact size currently available, yet is in no way a compromise of sound quality.

LA SCALA employs the same drive components as the KLIPSCHORN. The midrange horn is slightly smaller than that of the KLIPSCHORN and the woofer is shorter and is folded into two paths instead of three as in the KLIPSCHORN.

Fig. 12

DIMENSIONS: 90 cm. (35 1/4") high, 60.3 cm. (23 3/4") wide, 62.2 cm. (24 1/2") front-to-back. *Plywood Construction*

ARCHITECTS AND ENGINEERS specifications are available on request.

LA SCALA is a Registered Trade Mark of Klipsch & Associates, Inc.

Only Klipsch speakers and Klipsch 3-speaker master stereo system meet the 8 cardinal points of reproduction

1. Freedom from distortion. *Minimum distortion requires small amplitudes of air mass movements, even at peak transient power output. Bass diaphragm motion should not exceed 1/16 inch. Corner placement reduces distortion three fourths.*

2. Optimum size of speaker. *Large enough to reproduce the lowest audible bass tone at peak transient power output without distortion; not so large as to produce a separation of bass and treble events. Corner placement increases effective size of speaker 4 times.*

3. Freedom from rattles.

4. Freedom from shadows. *Obstructions between high frequency speaker and listeners can not be tolerated — treble wave-lengths do not turn corners.*

5. Freedom from cavities. *The space under a speaker box formed by mounting it on legs can destroy the bottom octave of response and deteriorate the next 2 octaves.*

6. Adequate spacing for stereo. *In a 14 x 17 foot room, for example, the 17-foot wall is apt to be best for the stereo speaker array. The Bell Telephone Laboratories (fountainhead of stereo knowledge) has used 42 feet.*

7. Accurate spatial values. *Ability to localize the virtual (reproduced) sound sources in their original spatial relationships requires 3 widely spaced speakers, regardless of size or type; retention of this quality over a wide listening area requires toe-in of the flanking speakers. These are fundamental teachings of the Bell Telephone Laboratories.*

8. Flanking speakers toed-in. *Such toe-in is naturally provided by corner speakers. The effect is to reduce shift of the virtual sound source for different listener locations. This is the only way to achieve a wide area for listening. (Another Bell Telephone Laboratories teaching.)*

PATENT NOTICE

Klipsch-designed loudspeaker systems are protected by the following patents:
2,238,023, 2,310,243, 2,373,692, 2,537,141, 2,612,558, 2,731,101, D 153,700; Canada 434,974 and pending applications.

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