

Stan's Safari 31

STAN SETS OUT THE RATIONALE BEHIND THE 'PERFECT HOME LOUDSPEAKER' HE PLANS TO BUILD

When this column first started, the plan was to discuss the choices I was making to create a new hi-fi system: a system that would owe little to established wisdom and convention but everything to giving me the greatest musical pleasure. The years have gone by, pushing me closer to my dotage, but also allowing me to become ever more dismissive of what others think of me and my ideas – a situation I find quite liberating. And so we return to the topic of loudspeakers, whose design allows for plenty of freedom of choice compared to the matching electronics.

My choice of midrange section is pretty well defined with a very refined 300Hz horn coupled to a huge 4in JBL alnico magnet driver. The efficiency is such that at normal listening levels the diaphragm hardly moves, so ensuring very low distortion. The highest frequencies inevitably need more work, so my attention is currently focused upon the low frequencies, in this case below 400Hz. But not too far below. Why so? Well in listening to many hundreds of live concerts I've always remembered those when the band really rocked. When dancing or reaching for the air guitar proved almost irresistible. And that was almost always the case with Fleetwood Mac, and surprisingly the case with the Beach Boys Knebworth concert in 1980.

Equally, many bands which I know have great rhythm sections fall flat when performing live. Invariably it has come down to the quality or set-up of the sound system, specifically an overblown bass often accompanied by a low-frequency drone underlying everything, so smearing the ideally tight relationship between bass guitar and drums. This wasn't always the case. In the (1970) days when The Who recorded the *Live at Leeds* concert, the PA systems comprised columns of 10in drivers having no low-bass output but nice response peaks in the upper bass region. These gave way to an era of horn loudspeakers that produced a very punchy bass sound but one which lacked deep bass.

My own professional experience of the challenge dates from working at Martin Audio when it was a two-man band. Dave Martin and I developed a

front-loaded horn cabinet using a 15inch driver and with a cut-off at around 40Hz. (Below that frequency the response fell away rapidly, as the drive unit was just loaded by the small volume of the enclosure into which it was boxed.) However, in reality a few interesting acoustic effects actually improved the performance. First, in practice the horn length extends slightly beyond the horn walls, so lowering the cut-off frequency; secondly, when horns are stacked the low frequency response improves, so a stack of four horns can extend the low frequency response by nearly an octave.

The combined effect was a very punchy bass with none of the low-frequency drone or boom heard from 'full-range systems' – those systems invariably involving ported or bass reflex cabinets. To my ears, the latter were the pits, creating an overblown and booming bass that was loud yet ill-defined. And the arrival of such systems, coupled with my experience of some less than optimally designed hi-fi loudspeakers, largely set me against ported cabinets for life.

In the world of hi-fi there is a tacit understanding that the system response should extend down to 20Hz, but for my music of preference – classic rock material – it is worth remembering that the lowest note of a bass guitar is 41Hz (31Hz for a 5-string), and the kick drum is normally tuned to about 30Hz. For my purposes, that therefore defines the lowest frequency I wish to care about. It can be instructive to look at the better bass guitar speakers. For example the Ampeg *SVT-810* has eight 10in drivers in a sealed box and is down 3dB at 60Hz, giving a tight clean bass sound. The best Fender cabinet I ever used had two JBL 15in drivers and its response was down some 12dB at 50Hz, easily compensated for by a small tweak of a parametric equaliser which would both flatten the response but also give a sharp cut-off below 40Hz, thus cleaning up the bass. In the early 1970s, this same thinking led me to endow the Cambridge Audio *Classic One* amplifier with an extraordinary rumble filter which rolled off the response at a rate of 50dB per octave. It was particularly intriguing that this filter cleaned up the bass reproduction no end, even when replaying tape recordings where no rumble was present!

By this stage something of a pattern will be emerging, because for me the optimum musical pleasure comes when I extend the frequency response just as low as necessary to reproduce the recorded material, but then effectively filter out anything below that. The key factor in a ported cabinet is that it artificially extends the low frequency output by incorporating a Helmholtz acoustic resonator into the design. This resonance is normally set below the natural resonant frequency of the bass driver