VALVE

VINTAGE AUDIO LISTENERS AND VALVE ENTHUSIASTS
1127 N.W. BRITE STAR LANE, POULSBO, WA 98370

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refoaming AR3a's

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VALVE

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Editor and Publisher
Dan Schmalle
Contributing Editors
David Dintenfass
Doug Grove
Resident Smart Guy
Paul Joppa
Audio Archaeologist
Eric Lenius

Our mailing address:
VALVE
1127 NW Brite Star Lane
Poulsbo, WA 98370-8241
by phone: 360-697-1936
fax: 360-697-3348

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editor's thing

Well, every audio magazine is talking about speakers for SE amps these days, even *Stereophile*. So I thought we should add our own warped viewpoint to the heaps of opinion obstructing your choice.

I'll start by saying that one of the best SE amp/efficient speaker combinations I've heard was an Ongaku playing some Wilson X-1's. The piece I heard was that gorgeous female vocal on the Living Stereo Sampler CD, track five, I think.

OK, got the 'proof that I have heard the most expensive and still am as uninformed as anybody' out of the way. Well, if current state of the art doesn't interest you, then maybe this month's vintage state of the art shootout might. What's the best vintage speak? See page 4 for some thoughts on the subject. You might want to check out the sidebar on page 6 too, which tells of an interesting end result to our shootout. Also, read the specs of the state of 1936 art VOIGT loudspeaker on page 12.

If state of the art isn't your thing, how about 'state of the parts'. This month I present a super simple full range open baffle speaker project that works beautifully with the one tube amp described by Dave last month, as well as any other low powered tube amps. It makes a great speaker for experimenting with single ended, and it's so cheap to build you can throw it away if it ain't yo' thang. See page 7.

And Doug helps us resto types out with a great primer on refoaming vintage AR3a's, most of which applies to just about any vintage driver with a foam surround. Check out page 10.

If this doesn't satiate your speaker appetite for a while, you're in trouble!

Don't let the blue smoke out,

DAN

February

Come out to the old clubhouse in Poulsbo, Sunday, February 11, 12 Noon. We'll take a listen to the open baffle speakers I'm using in the S.E.X. Kit. I will have one or two versions of the 6DN7 amp prototyped as well. We'll also have an opportunity to compare a Fisher 200C tuner to its 200B predecessor.

march

Mike offered an invitation to us last month to visit his systems sometime. Among other neat items, Mike has a system using Altec 604's, SE 300B's and Magnequest iron, and triode powered subwoofers. He also has some gigantic Tannoys and some really nice Mac gear. I will tentatively schedule a meeting at his house in Olympia on March 3, 12 Noon pending his approval. Surprise Mike! Watch for verification of this Meeting date in the next issue.

coming late this spring- super Lowther!

Tony Glynn is putting together a system composed of silver voice coil Lowther PM7A's in his new cabinets, which are a much improved version of the Acousta cabinet. His main line amps will be Baby Ongakus, as described in the last issue of *Sound Practices* (Come on, you *need* to subscribe to it!). They are SE 2A3 amps with Magnequest silver OPTs. Tony would like to bring this system up for audition once it's all together later this year.

He's such a gambler that he has already ordered a S.E.X kit amp to use with the Lowthers as well, and plans to have other amps on line as time progresses, so that he can field questions from prospective Lowther users about the best amp/speak combos.

Altec A7
vs.
QUAD ESL
vs.
Lowther
Acousta
*
The vintage speaker shoot-out of 1996

This event really made me appreciate the amount of interest and support there is for vintage and tube audio in the Puget Sound region.

With only moderate effort we were able to get three pairs of big gun vintage speaks in the same room, to try establish which might really be best. I suspect this hasn't been done anywhere else in recent times, and we have Eric, Dave, and Doug to thank for their combined efforts in getting good stock, working examples of these great speaks to us.

Okay here's the setup:

We listened in my shop/listening room, a sort of squashed L shape, 30 ft long and 12 to 15 ft wide, with an acoustic tile 7ft ceiling. Back wall has 16 sq ft of Sonex, side wall some eggcrate foam, and the concrete floor had a 30 sq ft eggcrate foam pad about 2 ft in front of each speak.

Front end: Onkyo DX1400 with resistor I/V converter, 6922 mu stage output

amp: World Audio 6080 SE Integrated

interconnects: 15 ft RG-8 cable

speaker wire: 16 ga stranded

We listened to three tracks on each set of speaks:

One from *Magnum Mysterium*, Westminster Choir, Chesky CD83, for vocal imaging, balance and detail;

one from *Jongen/Saint-Saens*, Guillou and the Dallas, Dorian DOR-90200, for frequency extension, string smoothness, complex instrumentality, and large hall ambiance;

and one from Franck: Piano Works, Paul Crossley, Sony SK 58 914, for "in the room" sound and microdynamic resolution (wow, I even impressed myself with that one).

At the last minute before starting I printed out a scoring sheet for any of the twelve in attendance to scratch notes on. I suggested notation of the following qualities for each speak:

tonal balance, frequency extension, soundstage width and depth, transient speed, dynamics, voice reproduction, and individual voice and instrument clarity.

Here are some of the comments by category. Comments with a pound sign are mine:

Tonal balance: A7 - bright/hard, some honk, but good balance/ horn sound/ #fairly neutral except for that honk!

QUAD - beautiful, seductive, treble a bit recessed?/ outstanding/ smooth!/ #good balance with a slight 'planar plastic' edge to voices.

Lowther - hair too much mid-treble, otherwise outstanding/ excellent/ real smooth!/# very smooth except for the upper bass/lower mid hump that shows itself at higher volume levels.

Frequency extension: A7 - Nice low end, hi's bright, but with muffled highest end/ good low end, high end soft (padded down 3dB)/organ bass ok/ # bass doesn't really go very low.

QUAD - missing highest end, good bass-clean/ excellent, clean low end, nice high end (but not excessive), slightly'muted', better bass*(than A7)*/ # a bit rolled off on the top, but better than the other two, absolutely the best bass ex-

tension (surprise!) by a wide margin.

Lowther - good high end, cleanest low end, but lowest notes are a bit weak/ clean highs, less bass-but clear/ # high end quite nice dead on axis, ain't much bass.

Soundstage width: A7 - between/within / okay - seems narrow at times/ #nothing outside the speaks.

QUAD - wide, beyond speakers, nice/ # very wide if you are in the sweet spot, off axis the illusion goes away.

Lowther - wide and precise/ excellent/ # like QUADS, fabulous at the exact sweet spot. Maybe better than QUADS off axis as well.

Soundstage depth: A7 - recessed - behind the speakers/shallow/ # good on vocal piece, but not on instrumental stuff.

QUAD - between speakers/ better *(than A7)*/ # a bit shallow due to lacking dynamics.

Lowther - best so far, a bit forward?/ excellent/ # great midrange emphasis helps to make this best.

Transient speed: A7 - crisp/ slow/ good / # OK.

QUAD - very clean/ better/ excellent/ #like lightning, but hampered by plastic panel sound in upper midrange.

Lowther - not as clean but very believable/ fast; excellent/ #close to QUAD, HF rolloff from my off axis position makes it hard to judge?

Dynamics: A7 - *(the left tweeter started rattling at higher levels. Eric said that was the only driver in the system that had not been rebuilt)* some HF crunch-resonance?/ ? muddy/ good/ # right in the middle, as is its efficiency.

QUAD - not much at 4W!/ good/ # OK, but not much excitement. Hard to hear dynamic variation in pianist's style.

Lowther - nice, didn't push it/ best!/ excellent/ # far and away the best, microdynamics of piano put it in the room.

Voice reproduction: A7 - OK/ Nice/ okay, ringing in soprano (and lower)/ # most realistic, apparently due to forwardness of horn emphasizing singers' enunciation and hall ambience. A7's do voice very well.

QUADS - realistic, appealing/ some ringing in soprano/ excellent, very natural/ #speed and presence make these near great, but there's that damned plastic sound again!

Lowther - very nice, almost as good as QUAD/ excellent, smooth - could hear all the detail!/ # wonderful, but lower mid boxiness detracts a bit from male voice at higher volume levels.

Individual instrument clarity: A7 - some blurring on massed strings/ strings very clear/ muddy/ # OK in midrange, so-so at freq. extremes

QUAD - more homogenized/ excellent, no muddiness on massed strings/ silky smooth/ # absolutely, positively best strings. Lack of dynamics in midrange blends some instruments of a kind together. Speedy bass makes it best in this region.

Lowther - nearly as clear as A7, but smoother and cleaner/ good, slight blurring on massed strings; best piano! detailed!/ # off axis hf rolloff and lightweight bass make this a great, midrange sensitive speak for sax, guitar and piano, but I don't get the whole story on complex orchestral stuff. Quite realistic though, rather like sitting 25 rows back.

OK. The bottom line is, A7's placed second to a tied QUAD and Lowther.

Mike's (I <u>think</u>) evaluation sums up nicely:

" I like both the QUADs and the Lowthers. It is very hard to describe why. I think it depends some on the music being played *(here,here - dan)* as to which of the two I like better. I would like to take both sets home for at least a month in order to give a better evaluation. Maybe I liked the QUADs a little better, but I liked the bass and piano on the

Lowthers - Hey those Whamodynes are nice too.

Which brings me to this sidebar:

after the smoke cleared...

When we finished the audition I asked the gang of twelve listeners if they would listen to the Superwhamodynes and give me some input, before voting which vintage speaks to use the rest of the day.

A couple of the guys made another column on their evaluation form. Here's what they wrote:

Tonal balance: excellent/ excellent.

Frequency extension: fantastic/ excellent- best bass, extended highs.

soundstage width: excellent/ good

soundstage depth: excellent/ good

transient speed: good/ excellent

dynamics: excellent, superb piano/ good- equal to Lowthers.

voice reproduction: excellent/ very natural; good.

individual instrument clarity: good, some blurring on massed strings, QUAD is still the best on this/ good- piano not as good as Lowthers *(I must say that I disagree with this one comment!)*, teeny bit of ringing.

Final comment on one of these forms: "Whamos have the best overall attributes."

Thank you for your kind words!

I add one personal observation:

The Whamos have clearly superior extension, however I find a slight brightness from the titanium tweets creates a bit overdetailed presentation. I have tried a piece of 1/2" wide vinyl tape 1/4" in front of the dome, and this seems to smooth the response a bit. No one else seems to notice this slight, very HF peak. I will try a grill cloth to relieve the effect.

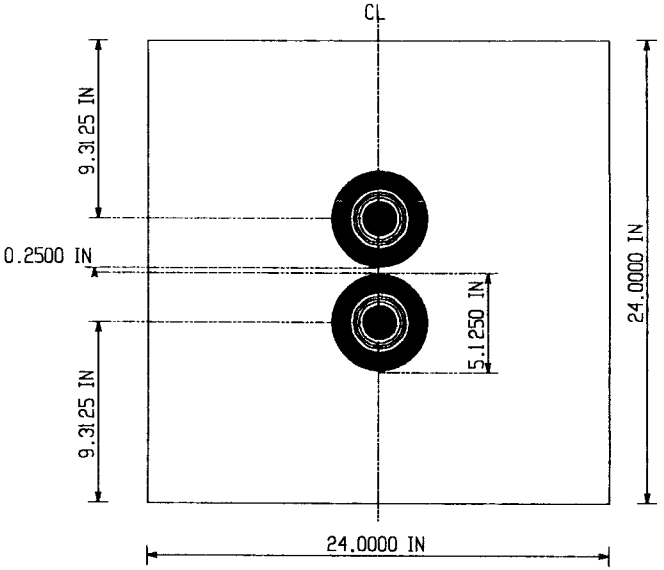
What did the members vote to listen to the rest of the day?

Superwhamodyne!

dan

cheap speaks!

How the S.E.X. Kit speaker came about,with a suggested design for building your own inexpensive, efficient, open baffle, full range loudspeakers, for low risk Single Ended eXperimentation



CUT 4.375" HOLES FOR DRIVERS

ATTACH DRIVERS WITH SILICONE SEALER AND #6 X 1/2" SCREWS

MCM 55-1290 5" Aluminum Cone 'Musical Instrument Speaker'	
RMS Watts	30
Peak Watts	60
Frequency Response	96Hz-15kHz
Impedance	8 ohms
SPL	91 dB
Q_{TS}	.94
V_{as}	.18
f_s	115 Hz Note: Most drivers I have tested have an initial f_s of more like 140 Hz, but this seems to drop with use, to as low as 112 Hz.

Last month Dave told you about his development of a pure and simple one tube single ended amp. While simple in design, this amp was developed with fidelity in mind, as it was destined to run his Lowther Acoustas.

You may recall that the prototype was built breadboard style at the December VALVE meeting/Holiday party (I'm still finding champagne corks in the corners and under junk boxes from that one) The Lowthers were about 90 miles away and though we had fun running the Whamos with it, I really thought that an amp this simple and pure needed a speaker of the same design philosophy to go with it If you've been with us since '95 you know about my extreme experiments in the early stages of development of my Superwhamodynes. The first design, One Way, was a vented design built out of a high tech carbon filled foamcore, using the same aluminum cone 5" full range drivers I use in the Whamos.

Well, One Way was a flop, due to the buzzy qualities of the foamcore and my attempt to get the 5 inchers to run clear down to 35Hz.

But imaging was really good, and the one way drivers went pretty high, about 15 kHz. I knew that someday I'd come up with a better way to utilize this quick little speak in a full range application.

Back to the December meeting. I'd been auditioning raw drivers in the weeks before the meeting and noticed that the 5 incher had some bass, even in free air. This is as it should be, since the driver's Q is about .91.

So when I got the bug to make a quick speaker for the one tube amp, I grabbed two (for better efficiency) of the 5 inchers off the shelf and stuck them into holes cut in the box my new kitchen sink came in. I left the back open and set the contraption on a folding chair, with a big old transmitter power trannie inside to keep it from falling over.

OK, so here's this crappy old box with a couple of drivers held in with packing tape on this folding chair I got at St. Vinny's for $1, being run by this amp Dave built in 20 minutes on a scrap of particle board shelving, and it sounds really good. OK, not super loud, but loud enough for small room type listening. The midrange is like honey, with no wierd phasey stuff, voices are smooth, and there's actually some bass!

Paul has been cajoling me as I build this thing and he suggests a little stuffing to compensate for the flimsy cardboards' low freq. loss. I brought out a couple of plastic bags of fiberfill and shoved them in the back, bags and all. Then we moved the speaker out of the middle of the room, closer to the wall.

The bass got quite respectable, getting down to at least 110 Hz, and maybe even 100 Hz. Look, you can't read what a speaker sounds like, but everybody was Shutting Up, Listening, and looking at each other like, "How can this be?"

I compared this beast with some other small speaks over the next week, including a Minimus 7 with the *Speaker Builder* crossover mods (nice mod), and a pair of Dynaudio D-28's crossed over to Audax 5.25" Aerogels in vented .15 cu. in. angled front cabinets. I kept going back to the open baffle one way for its better balance and killer midrange. Now look, you're not going to cream your pants listening to the 1812 Overture or Hovhaness' Mt. St. Helens with an open baffle one way and one watt.

But you can sure appreciate voices from as low as Johnny Hartmann to as high as Leontyne Price. And piano and guitar can be magical.

And you don't have to accept any boxy sound as the volume goes up. The pair of drivers, wired in series for a happy 16 ohms, can handle up to 30 watts in theory, although I might be hesitant to run 30 watts of deep bass through them. And baby, with 30 watts they would be loud.

OK, so I have this ragpicker's version of a speak I like sitting in the middle of the listening room. Can't stay like that for ever, and I think Paul is right about the cardboard eating up bass.

So I get me a 2'x2' piece of 1/2" oak veneer plywood, and cut two holes such that the drivers sit in vertical array about 1/4"apart. You can't get much simpler. And it sounded just as good as the twice as big, stuffed cardboard version, going down to about 110 Hz.

The two drivers are each rated 91 dB, which theoretically gives 97 dB in series for a completed speaker. My adventures with the Superwhamodynes have taught me that this is only true if the drivers are close together relative to the listening distance. With the 1/4" spacing between the drivers, this criterion is pretty well met, and the flat little speak plays pretty well with one watt. I found that running a new modded version of the S.E.X. kit amp, which puts out two watts, made the speakers play at a level you could honestly call loud.

And that midrange is really sweet. Vocal stuff is really neat to listen to. The SEX speaker has that same sense of image depth that the Whamos have because of the rich midrange.

And the bass gets just deep enough to be there. An interesting experiment was to put the SEX speaker online with the Superwhamodyne bandpass subwoofer This involves no crossover, as the upper rolloff of the sub matches pretty well with the lower rolloff of the SEX speaker.

This makes a sort of poor man's Superwhamodyne, and works really well.

Now I'm not going to tell you that this is the perfect speaker, 'cause there ain't no such thing. Using a five inch driver full range means that it's going to beam above about 4 kHz, hf rolloff some where in the 5-15 kHz range, and be pretty light in the bass.

What you get with these cool aluminum drivers is a slightly noticable beaming above 4 kHz (which is why the Whamos cross over to a dome tweet there), and a gentle rise from about 6-15 kHz, which gives a slightly forward "TV speaker" sound to most 5" speakers. I ended up using this to my advantage with the S.E.X. kit, as the inexpensive output transformers used to keep costs reasonable are a bit rolled off from about 9-10 kHz up. This rolloff combines very nicely with the gentle peak of the drivers to give a response that gets up to around 15 kHz before rolling off. If you build these speaks for other amps you may want to work up some sort of EQ that compensates for the rise above 6 kHz. It's not enough of a problem to keep me from trying the speakers with all sorts of other amps, in fact, the brighter, leaner presentation and doubled output power of the World Audio 6080 SE integrated is a bit more realistic than the S.E.X. amp on some symphonic material, although not as emotional. So don't let this info keep you from trying the pure and simple un-EQ'd drivers first.

One caveat about these drivers. In ordering a batch of ten, I got two clinkers that rattled or rang at high volume levels. I have since been assured that MCM, the distributor of these Taiwanese drivers, will take back any products that don't meet your satisfaction. Another batch of ten now sits in the shop, waiting to be tested, and all drivers included in S.E.X. kits will be tested, so it may be worth getting these drivers through Electronic Tonalities, either with the S.E.X kit or without. If there's interest in this, I'll sit down and figure out what to charge for them. The price will probably be around $15 each, plus shipping and sales tax. I'll include an impedance curve with each driver so you can match up the best combination of curves for each speaker.

If you would rather take your chances, the drivers are part number 55-1290, available from MCM Electronics.-dan

replacing AR-3a foam surrounds

by Doug Grove

How many garage sale speakers have you passed up because it looked like the cat clawed the woofers to death? Or, have your 70's vintage woofer foam surrounds mysteriously vaporized? Even speakers in ported enclosures don't work very well without surrounds, but woofers are usually quite hearty and *can* be repaired. I had been using clear silicone sealer in a desperate attempt to patch the foam woofer surrounds on my early 70's AR-3a speakers. The foam seems to revert back to its liquid petroleum state in spite of careful handling through the years. This is frustrating because many late 60's woofers used rolled cloth woofer surrounds which have survived over the years remarkably well. I'm sure that my silicone repairs affected woofer frequency response and sensitivity, and that new surrounds would certainly restore performance. The magnets, baskets, cones, spiders, and voice coils were all in excellent shape, so I decided that new foam was all that was needed. the challenge was to replace the surrounds while maintaining voice coil alignment in the magnetic gap.

I ordered a surround replacement kit from *Stepp Audio Technologies*, a supplier recommended by *Speakerbuilder* magazine. The kit came supplied with two foam surrounds, glue and installation instructions. I checked the replacement foam size against the woofers and found them fairly close (AR-3a woofers are nominal 11" speakers on a 12" frame). A quick review of the instructions left me shuddering at the thought of doing all this work, only to have the voice coil start rubbing after installation. After some reflection on the whole undertaking, I devised the following procedure for all cone-type speakers with foam or rubber surrounds.

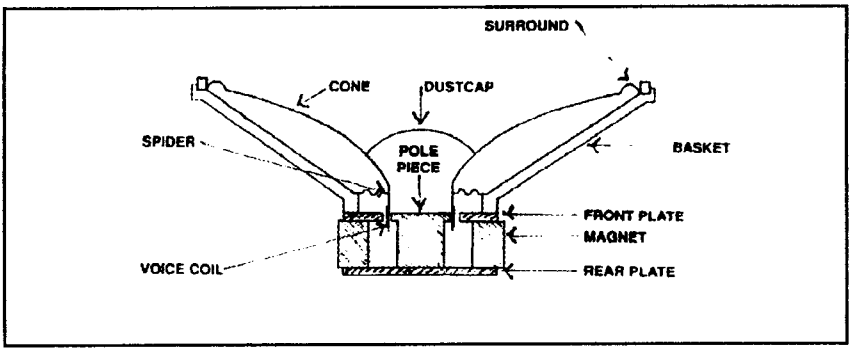
First, the obvious: I removed the grill cloth assembly. I then unscrewed and removed the speaker from the enclosure, being careful to pry away any gasket or sealing materials, and taking care not to strain the connecting wires. The connecting wires were then unsoldered. Note that removing the woofer creates an excellent opportunity to perform other maintenance work on the loudspeaker system, such as cleaning scratchy level controls, upgrading crossover wiring, etc. The speaker and work area were kept as clean as possible, with no loose iron laying around to be attracted by the magnet. I protected the cone and surrounds by using blocking to hold the frame up from the work surface when the speaker was placed face down.

Now comes the part I feel most critical to this process: the voice coil must be locked in place to insure alignment during the surround replacement. While the spider provides alignment and suspension, an out of plumb or out of round cone will cause voice coil rubbing. In order to access the voice coil, the center dust cap was removed. This was done by carefully cutting it away with an Exacto knife. I then slipped multiple layers of 1/2" x 1/2" paper shims vertically into the gap between the inner magnet pole and the voice coil to hold the cone in position. This prevented rubbing while working on the cones and assured voice coil alignment when the job was finished. It also allowed me to position the cone at the best in/out level for gluing on the new foam.

With the cone fixed in place, I cut the old surround with scissors. The foam was easily removed from the basket edge, so I scraped it clean with a small putty knife. Next, I carefully separated the foam from the cone edge, removing foam and old glue. I then vacuumed out loose materials around the basket, cone and spider. I prepared the basket and cone edges for the new foam by

applying a thin coat of speaker glue I had left over from my Lowther work. The glue is best applied with a syringe and spread with a finger. I let the glue dry for a few hours.

Now it was time to fit the new foam to the cone and basket. The glue provided by *Stepp* has properties common to both carpenter's glue and contact cement, allowing some repositioning during installation (*Stepp* did not provide enough glue, but I was fortunate to have enough left-over glue of the same type from the Lowther project in which I used surrounds from another supplier). Glue



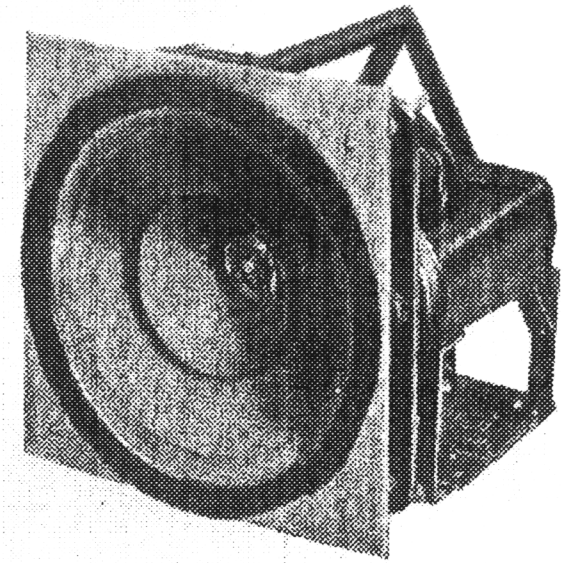
was first applied to the foam surround inner flange and the outside edge of the speaker cone. Once tacky, the two pieces were set in place and carefully positioned along the circle of the cone. Light pressure all around the cone edge helped until the glue was set. After the inner surface had dried for a few hours, the procedure was repeat with the outer surround flange and the basket face, again keeping the surround in circular alignment. I was careful to avoid folds or stretched areas which could affect voice coil alignment or restrict cone excursion. This is critical, as the cones are not perfectly centered in their manufacture (off by 1/16" or so) so I positioned the half-roll by eye.

After a few hours drying time I removed the voice coil shims and checked alignment. There was no rubbing when the speaker was depressed from the center. I checked the gap for any stray iron pieces and slid a piece of doubled over masking tape around in the gap for good measure. I also checked total cone travel and provide some "break-in" by moving the cone in and out within reasonable limits. Further testing was performed by placing a small 9 volt battery across the terminals, changing polarity to check the cone travel in and out. Over 3/8" excursion in both directions! No rubbing! I glued the dust cap back on with the remainder of the speaker glue and set the woofers face down overnight to cure.

I cleaned the enclosure mounting surface and cut new gasket material. I used 1/16" thick closed-cell foam packing, which I trace and cut to size for the speaker, using a paper hole punch for the mounting screw cutouts. As with the Lowther drivers, I found this sturdy foam material provided excellent acoustic coupling to the baffle, and in the case of the AR-3a woofers, for sealing the enclosure.

Next morning I reconnected the lead wires and remounted the speaker. frequency response testing with my test CD and various music programs revealed improved sensitivity, deeper bass and less distortion. Time required for this project (two woofers) was about six hours total, not including glue drying time and overnight curing.

the Voigt Loudspeaker



original caption in Voigt Patents Ltd. flyer reads: "Normal type Voigt Loudspeaker Unit fitted with Twin Diaphragm. Courtesy *Wireless World.*"

SPECIFICATION

WEIGHT-Unit only (Normal Type 31 lb.)

MAGNET GAP-2 mm.

FLUX DENSITY - 16,000 to 17,500 gauss under working conditions.

FIELD CONSUMPTION - 40 watts approx. (at 10 watts Flux density is approx. 10,000).

FIELD VOLTAGES - Model A. 6 to 8, or 12 to 14; Model B 33 to 40 or 66 to 80 voits; Model C, 100 to 120, or 200 to 240 volts; Model C.W. 170 volts; Model D, 180 to 200, or 360 to 400 volts.

ELECTRO ACOUSTIC EFFICIENCY - Believed to be about 25 to 35 per cent.

SOUND POWER OUTPUT estimated at 2 x 10^7 ergs/sec. for normal speech and music (with 6-8 watts R.M.S. speech current), or double these figures with D.P.Diaphragm.

RATED MUSIC INPUT - Normal type diaphragm from a few milliwatts up to 8 watts R.M.S. Double power type diaphragm up to 12 watts R.M.S. approx.

SPEECH COIL RESISTANCE - 15-17 ohms (aluminium wire).

DYNAMIC IMPEDANCE - 30-35 ohms at normal frequencies.

DIAPHRAGMS - 6 in. Standard or Twin.

SPEECH COIL CHOKE - Tapped, for tone control.

FIELD SHUNT - A shunt resistance is permanently connected to damp the surge when the field current is switched off.

CONNECTIONS - Both speech and field coils are brought to a plug-and-socket arrangement.

STRAIGHT HORNS - Voigt " Tractrix " ;

4 ft. mouth (wood, collapsible) ; overall length, including unit, 4 ft. 10 in.

3 ft. mouth (metal, all-weather) ; overall length, including unit, 3 ft. 5 in.

2 ft. mouth (wood, collapsible ; or compo, showerproof) ; overall length, including unit, 2 ft. 10 in.

DOMESTIC REFLECTOR TYPE HORNS - Details on application.

From August,1936 VOIGT PATENTS LTD. brochure

Tim Hunter of Klipsch includes among his duties that of curator of the Klipsch Museum. He very generously Fedex'd a copy of a 1936-37 Lowther Voigt catalog and a 1936 Voigt Patents Ltd. Flyer (acquired with a Voigt Corner Horn last year) to VALVE last week. The information herein has been lifted from one of these rare documents, the VOIGT PATENTS, LTD. flyer. Please note the unmistakable similarity in appearance of this vintage Voigt with the current Lowther drivers. That they haven't changed that much in 60 years says one heluva lot about P.G.A.H.'s original design, and probably a lot about the British audio mentality as well - dan

" THE UNIT

The Voigt Loudspeaker is noteworthy for its extremely high efficiency and high quality. These two factors can be expected to go together, because bad quality is generally caused by the tendency to reproduce certain tones much louder (i.e. with much greater efficiency) than others. If the average efficiency is very high, it becomes impossible for any one tone to be reproduced with much greater efficiency, as it is impossible to exceed the natural limit of 100 per cent efficiency. In the case of the VOIGT Loudspeaker, a unique and patented magnetic system which produces the exceptionally dense magnetic flux of 16,000 to 17,500 lines per sq. cm. **under working conditions** across a 2 mm. gap is used. Since the force on the moving coil with a given current increases as the flux density increases, it will be realized why such a high flux density helps to produce high efficiency.

Such an intense field has also an important secondary effect - namely, that by saturating the pole tips completely, the permeability of the iron near the gap is made so low that the iron plays practically no part in raising the inductance of the moving coil. In practice, the inductance of the moving coil is substantially less when the field is switched on than when it is off. As a result, the dynamic impedance at 8,000 cycles is only about 50 ohms, which compares favourably with an impedance of 30 to 35 ohms at normal musical frequencies. It will be obvious that a speaker in which the impedance varies so little over the scale can be accurately matched to the power valve, and that consequently the maximum transference of electrical energy will occur. Expressed in a different way, it can be said that, since the coil has practically no inductance, there will be no tendency to choke back the higher harmonics. These, therefore, have a much better chance of being properly reproduced than is usually the case. To reproduce transients "aperiodically" -that is, without the delay introduced when resonance of any kind is used to build up the vibration -it is necessary that the currents should not be wasted in overcoming the inertia of the moving parts. It has been shown that the saturated pole tips permit the high-frequency currents to be as great as possible; and it has been mentioned that the force on the coil with a given current is greater the higher the flux density. Since the available force on the coil is partly used to overcome the inertia of the moving parts, it will be obvious that by making this inertia as low as possible the maximum force will be left to do useful work. In the VOIGT Loudspeaker this inertia is made as low as possible by using aluminium wire for the speech coil. There are. therefore, three reasons why the efficiency for high notes is greater than with ordinary loudspeakers.

Two types of diaphragm are available-the standard and the twin. The standard diaphragm responds efficiently up to above 4000 cycles, characteristic curve with 4 ft. mouth horn being shown in fig. *(1).* This shows the curve on the axis and also 30° off the axis and indicates clearly how well the sound from the VOIGT Speaker will cover a wide angle without appreciable change in tone.

The twin diaphragm is slightly different from the standard and in particular is provided with a second truncated cone which deals with the frequencies above 4000 cycles. It is fully described later.

The Unit when fitted with normal diaphragms (standard or twin) and used on a suitable horn is intended to handle an input from a few milliwatts up to that required to produce a sound output estimated at 2×10^7 ergs/sec. This power is about half that of a nine to fifteen piece jazz orchestra and owing to the high efficiency of the VOIGT Speaker is obtainable with an electrical input of 6 to 8 watts. Used for speech alone, or with a bass filter of some kind, the unit can deliver a much greater output.

Alternatively, when greater handling capacity is required, a unit fitted with a double power diaphragm may be used. Such a double power diaphragm made of waterproof material is incorporated in the Protected Public address unit...

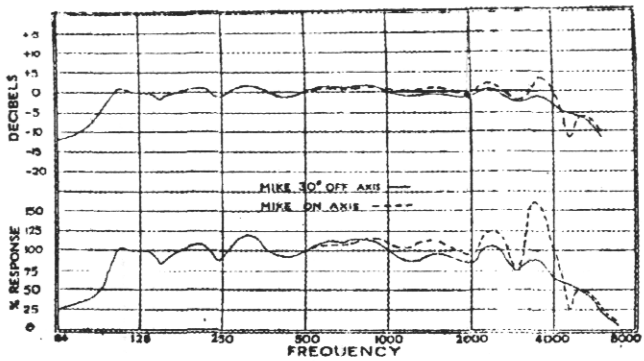
At very low frequencies-i.e. well below the horn "cut off"-the intense magnetic field helps to prevent excessive vibration of the coil. This is because the back E.M.F. produced by movement in the strong field opposes the current through the coil, thus reducing it. Boominess in reproduction and danger of rattle or damage due to excessive displacement is thus avoided. With pentodes, this protective effect is less marked. The response for very low frequencies is therefore greater, but the point of maximum movement is reached with less power.

SPEECH COIL CHOKE

A small tapped speech coil choke is provided with each speaker. This component is removable and can be fixed on the left or the right, or incorporated in the amplifier. It is useful with uncorrected pick-ups or "peaky" microphones for reducing the response at high frequencies, when this cannot conveniently be done in the amplifier.

If a sharper cut off is required, a 4mF condenser may be connected across the speech coil-the tapped choke remaining in series. On the other hand an adjustable resistance of say 200 ohms maximum may be connected in parallel with the series choke if it is desired to retain a definite fraction of the upper frequencies.

When the Unit is used for very high power, the Speech



Decimal scale ratio 20 DB to 1 octave.

Fig. 1
Characteristic curves of Voigt Loudspeaker with 4 ft. mouth wood horn and standard diaphragm.

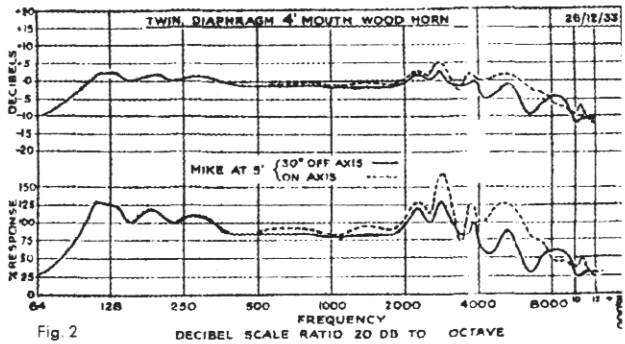


Fig. 2
DECIBEL SCALE RATIO 20 DB TO OCTAVE

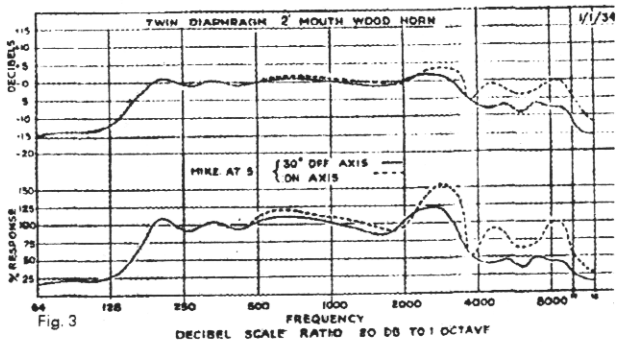
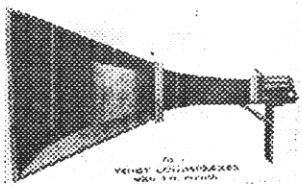


Fig. 3
DECIBEL SCALE RATIO 20 DB TO 1 OCTAVE

Fig. 4



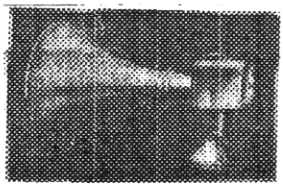


Fig. 5

Coil Choke connected in parallel with the speech coil provides, in cases where it is not possible to do this before the last valve, a convenient method of bypassing the bass. Even when the bass has been attenuated before the last valve, the speech coil choke in parallel is useful since it will bypass low frequency currents produced by the rectification of modulated higher frequencies, should the power valve accidentally be overloaded.

THE TWIN DIAPHRAGM

The VOIGT Loudspeaker with 4 ft. mouth horn and standard diaphragm is as good as is desirable for many purposes, it is, in fact, better than many so called "high quality" microphones in general use.

When really life-like reproduction of speech or music is desired, however, and really first-class microphones (such as the Voigt non-directional condenser microphone) are used, the reduced output above 5000 cycles with the standard diaphragm... becomes noticeable, inasmuch as it causes sibilants to lose intensity and transients to lose some of their natural sharpness.

A special TWIN diaphragm illustrated *(page 12)*, interchangeable with the standard, has therefore been developed in which one speech coil drives two cones, one dealing with the normal scale and the other with the region above 4000 cycles.

Figs. *(2)* and *(3)* show the characteristic curves obtained with the twin diaphragm on the 4 ft. and 2 ft. mouth horns respectively.

These curves show clearly that the top response is obtained, not by high concentration in one direction only, but that the distribution is exceptionally uniform.

To appreciate the full effect of the second cone, these curves should be compared with the curve of with the standard diaphragm *(fig. 1)*.

It should be noted that the twin diaphragm does not call for the use of special output circuits. Special filters are not required, but to obtain the full benefit of the twin diaphragm, an output transformer, the characteristic of which is really flat, is desirable. Suitable transformers can be supplied.

The difference in response at extreme high frequencies with the two horns is attributed to additional reflection in the longer neck, but is hardly noticeable in practice except under the most searching conditions.

The reproduction of speech on a perfect microphone /amplifier system using this diaphragm can be such that on direct comparison with original speech the difference is so slight as to be difficult to describe.

The twin diaphragm is so efficient at 11 kilocycles, that it is "too good for Radio" and is only recommended when a whistle filter is available. Suitable whistle filters can be made to order.

THE HORN

The VOIGT "Tractrix" Loudspeaker Horn will increase the volume and improve the tone of any ordinary loudspeaker unit.

The "Tractrix" is the only curve for a horn which really takes into account the fact that sound (particularly at low frequencies) spreads spherically and not with a plane wave front.

An air column bounded by this curve loads the diaphragm at its small end and radiates sound energy at its mouth more uniformly and efficiently than the well-known exponential or logarithmic horn.

Radiation resistance at the mouth of the "Tractrix" Horn is such that the sound is immediately transmitted to the surrounding air, and air-column reflection does not occur.

The Standard horn (shown in fig.*(4)*) is straight, with a mouth 4 ft. square and a throat (small end) 4 1/2 in. square. The overall length is only 4 ft. 10 in. including the unit.

An extremely useful feature is the ease with which the horn may be dismantled for transport and storage, the complete horn being in five sections fastened by bolts and wing nuts...

The standard 4 ft. horn loads the diaphragm from 128 cycles upwards. At frequencies below "cut-off" the use of a wide-throat horn with a large diaphragm has a big advantage over the older style of small-throat horn fed from a small diaphragm because the actual volume of air displaced is much greater with the larger diaphragm." Horn action is, therefore, not nearly so necessary for the production of sounds of low frequencies. Consequently, the response does not cut off abruptly as with small-diaphragm units on long horns, but holds for a little on account of the air column, and then falls away gradually, until it reaches the volume level obtained with a baffle. The response is still considerable, as much as an octave below the "cut-off " frequency.

The fact that the horn loads the diaphragm well at all frequencies not only maintains the response down to and below the horn "cut-off," but helps greatly to preserve the natural tone of transients. The horn carries any sound energy to be transmitted immediately from the diaphragm surface to the surrounding air. The delay common to ordinary baffle speakers (which is so detrimental to "attack") while the diaphragm works itself up to full amplitude is thus avoided.

For permanent outdoor installations the wooden horn is unsuitable, and a 3 ft. mouth metal horn in which the unit is completely enclosed has been developed. This loads the diaphragm fully from 180 cycles upwards (Full efficiency is obtained down to about 120 cycles.) It can be dismantled into four separate parts for transport. All studs, etc., have the ends burred over, so that it is impossible to lose any nuts or other small parts. In cases of emergency, the unit can be used in the metal housing alone, the volume and quality being quite remarkable.

When the loudspeaker is intended for any purpose for which reproduction at full strength of the fundamentals of the lowest musical frequencies is unimportant or when a different speaker is used for the bass the 2 ft. mouth horn shown in fig. *(5)* is very suitable. This horn has the advantage of taking up little space, the overall length inclusive of unit being only 2 ft. 10 in. It loads the diaphragm from 250 cycles upwards.

Full efficiency is obtained down to about 190 cycles. This frequency is low enough to permit excellent quality speech for which the horn is particularly recommended.

A Tweeter horn is available for use when the loudspeaker is required for extending the frequency scale of existing equipments.

busy? keep trying...

Finding myself deluged with phone calls these days, which I don't really mind, but I'd like to clarify a couple of things.

First, I will be working a lot at my bakery job for a while, so don't bother calling before about 11 am or after about 9 pm, as I get up at 4 am and work 'til about 10:30.

Second, I am always happy to answer your technical questions about restoration and scratch building, finding schematics, meeting times, and any stuff about VALVE and the newsletter.

Third, I am no longer a used audio dealer, and I don't have the time or inclination to track down equipment for people. Your best chance at getting good stuff is to become active in the club and get to know the other members. Jim Lissa at Classic Audio is a good person to leave specific equipment requests with also.

Fourth, I can't promise to remember to list something you want to sell in the newsletter unless you write an ad. Members will get a free plug as space allows.

By the way, you gotta pay if you want to play. The advice I give to member /subscribers is of much higher quality than to guys who have been telling me that they are gonna subscribe for the last year and a half!

So, to reiterate, if you need to know if a certain preamp is any good, or want info on building a single ended amp, or need service data on a tuner, I'm happy to oblige.

If you want McIntosh, Marantz, or 300B's, call Japan....

dan

may I brag?

Well, this is the first issue done on the new computer.

Oooh, baby, were talking 120 mHz Pentium with 16 megs ram, 1.08 Gig hard disk, CD ROM, 16 bit sound, fax /modem, tape backup, and an awesome 16" Nanao monitor.

Running Windows 3.1 at the moment, but there's a box of Windows NT Workstation and a box of Windows 95 sitting on the desk.

What this all means is that I can finally use the scanning, optical character recognition, and image processing software I've had sitting around here for a couple years, to make VALVE a little more interesting.

So now you can send me an article in either ASCII format or hardcopy from your printer (My OCR program falls apart on faxed copy I'm afraid), along with your great illustrations.

I use Power Up Express Publisher for Windows, which is a nice inexpensive DTP program, but not very good at translation of text and image formats.

I know for sure ASCII works, but have had trouble with RTF, so you may want to play it safe and stick with ASCII on anything you submit.

I also know PCX graphics format works well, and hear that TIFF is very inconsistent, so I'll request PCX files if you send illustrations.

The bottom line here is, keep the good stuff coming, even if you use crayon. We have some wonderful articles coming up in the next few months, but I need a lot more to flesh out each issue, as well as interesting old schematics and reports on your latest DIY projects.

Keep up the good work!

COMING SOON—

FROM ELECTRONIC TONALITIES

did you just tune in? here's what's happened so far...

Back issues

Volume 1 - 1994 issues - $20

a Williamson amp; Dyna Stereo 70 mod bake-off; converting the Stereo 70 to 6GH8's; a QUAD system; triode input Dyna MkIII; MkIII vertical tasting; smoothing impedance curves; Altec A7; Ampexes, Nagras and ribbon mikes; Triophoni, a 6CK4 amp; audio at the 1939 World's Fair; books for collectors and builders; V.T. vs. R.M.A. cross reference; FM tuner tube substitutions; Big Mac attack - the MI 200; 6L6 shootout; a vintage "audessy"; more FM tuner mods; vintage radio mods; Heathkit rectifiers; PAS heater mod.

Volume 2 - 1995 issues - $20

Rectifier shootout, tube vs. solid; FM 1000 recap and meters; single ended 10 amp; triode output W-4; Optimus 990 - speaker for SE?; star grounds; tuner shootout; Living Stereo, vinyl or CD?; World Audio SE integrated; firin' up - smoke checking; Brook 12A schematic; 6C33 vs. 3C33; Heathkit power transformers; 6B4's + Magnequest = SEcstasy; W5 mods; triode operating points; Dyna restorations; Marantz 7,8 and Scott LK150 impressions; hackable vintage gear; Quasimodo - PP 805 amp; restoring a Scott 340 in 75 minutes; a dream system for 78's; cartridges and styli for 78's; Restoring a Lowther, part 1&2: easy tube CD output hack; 6ER5 phono preamp: 304TL & 450TH SE operating points; hypothetical DC ESL amps.

And here's what we hope to have in 1996:

Single Watt, Single Tube, Single Ended, an amp for Lowthers; the Vintage Speaker shootout of 1996, QUAD vs. Lowther vs. A7; the Single Ended eXperimenter's kit, amp and speaks for $200; a Heathkit W-1 thru W-5 shootout; a new, improved tube CD output; Eico HF 60 vs. HF 50 vs. HF 89; how to build the Superwhamodyne, a speaker for single ended amps; and a whole lot more!