

Blackie Pagano: Secrets to Vintage Tone, Part II

by DAVID JUNG

Last month, Blackie Pagano offered insights on wrangling tone based on his numerous years in the biz working for big-time musicians. We focused on tubes and cables, and this month he tackles a couple more-technical elements.

Let's talk caps, new versus old...

Assuming we're talking coupling caps, it's a matter of taste. There's a lot of great stuff out there, and I generally like to use a mix – a trick I learned from other hi-fi designers and personal experience. Everything sounds like what it's made of, so things made of plastic have a plastic resonance. That's why I do not prefer metalized capacitors, because they're made with a metal film bonded to a plastic substrate—there's more plastic than metal, and you can hear it.

When I build something, I use a mix of capacitors, because every material has its own sonic signature, and you don't want any one sonic signature to dominate. I want to use the best materials to tailor each part of the circuit, depending on the signal/voltage levels. The same basic thing can be said for preamp tubes. I almost always use a mixture of brands to get the best sound.

Some enthusiasts believe matched tubes give a better, more even output compared to unmatched tubes, which may have a tendency to push and pull off of one another and make your sound more harmonically rich.

In a push/pull circuit, you want both sides to be doing the exact same work, and that requires close current matching. In a push/pull amp, the topology basically cancels even-order harmonic distortions, and has a relatively low percentage of odd-ordered harmonic distortion, up until it clips. But the odd-order harmonics tend to predominate at all power levels. Which is a certain sound, and is somewhat more abrasive than when you have even-order harmonics predominating, as in a single-ended amp topology. If one side is drawing different current, you're introducing even-order harmonics, which don't get the same cancellation.

However, in a push/pull amplifier, the better those two sides are matched, the quieter the power supply will be. Old-school push/pull guitar amps don't have a lot of power supply filtration, and rely on the current matching of the two sides

of the circuit to keep hum and power supply noise levels acceptable.

If you want to accentuate even-order harmonics, you can easily do that in the driver stage without sacrificing noise specs. Instead of driving the tubes perfectly the same, you simply drive one less than the other. I've done this a number of different ways. Certain types of driver circuits do that naturally, like in old tweed amp; the splitter that uses a plate and a cathode (split-load phase inverter) is always unbalanced, which is one of the reasons tweed amps sound the way they do – it's an inherently unbalanced phase inverter. In fact, you can take a later, long-tailed pair inverter and install a pot to adjust the two triodes so one drives more than the other, essentially adjusting their harmonic balance. This pot would adjust what would sound like a Depth control.

The thing is, odd-order harmonics don't occur in nature, so our ear is sensitive to them. It's an unnatural vibration, and it can be really good if you're making aggressive music—if you want discord. But even-order harmonics sound sweet.

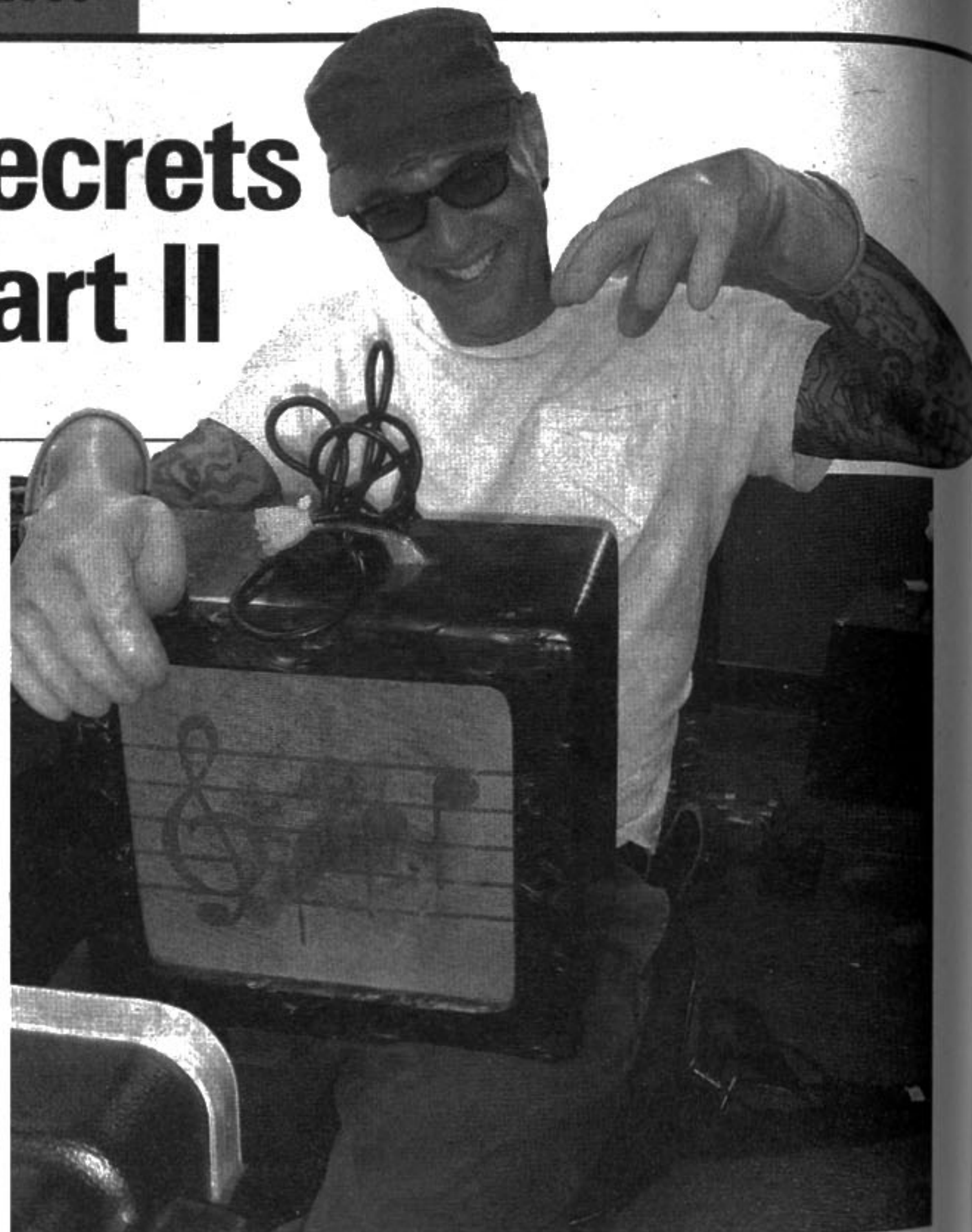
Is that why some old Fender tweeds sound so good? Did they maybe not sound as good when they first came out of the shop as they do today?

Well, age is always a factor. Speakers age, spiders get looser, magnets demagnetize. Compare an old alnico speaker with a new one and you'll hear it. But a tweed amp brought to spec with all new parts will still sound good because of the topology of the circuit.

Fender's new reproduction amps use modern parts, and they sound good. But they're not like what Victoria uses, which is the same stuff I use to do restorations – carbon-comp resistors, film-in-foil capacitors... no metalized films, none of that stuff. And with capacitors, generally speaking, I prefer film-and-foil capacitors.

What are your thoughts on paper-in-oil caps?

Paper-in-oil and foil-in-oil are signal-



path caps I often use in custom builds. There are many good types and materials to choose from – tin foil, aluminum foil, copper foil, even silver foil. They all have their place, and I often use Russian military surplus paper-in-oil caps to rebuild early Gibson amps and others, which used that technology. But by and large, new reissues use modern stuff, and not particularly high-quality. When you're building a million of something and you can save a penny, that's big bucks. And some engineers probably aren't as versed in the classic techniques as old-school repair guys and vintage amp makers.

Leo Fender's amps were inexpensively mass-produced amps, but they weren't cheap. If you looked at the prices for that time, they were fairly high because he was thinking longevity and quality. He obviously achieved it, because we're still using – and loving – his amps today. Forty years down the line, they're still great to work on, they sound great, and they usually only need a cap job or new tubes.

Are there little upgrades that can be done to new amps that make a big difference?

Yes. I often upgrade components in the reissue Twins and Deluxes. It's the same classic circuit, but the component technology is completely different. I usually start with plate resistors, replacing metal-films with carbon-comps. That's a huge difference right there. I also upgrade screen resistors because I want the amp to sound the same hot as it does when it's just warmed up.

I don't want it to sound weaker after being used for an hour. I may prefer a five-watt resistor to a two-watt resistor, and I prefer a wire-wound resistor – a real one-percent military resistor – to a little metal-film resistor or a cheap wire-wound. I upgrade them, sonically, and for reliability. Better tubes usually make a big difference, as well. Then sometimes after that, better speakers, though newer speakers sometimes are a little aggressive-sounding.

What kind of speakers do you like for replacements?

Well, newer Fender stuff usually comes with K-series Jensen's with gigantic magnets. But I'm pretty wild about the new Jensen speakers with neodymium magnets. I use those a lot. They sound smooth out of the box, and the magnet structure is tiny, so they weigh a lot less.

How does the size, strength, and makeup of a speaker magnet affect tone?

Alnico and neodymium both create more magnetic flux with a smaller amount of material than ceramic. In order to get the efficiency you need, you can have a smaller magnet with neodymium or alnico than ceramic.

They sound different because, again, all materials sound different. So a large ceramic-magnet speaker often sounds aggressive and forward, a small-ceramic-magnet speaker, like the Concert series, tend to break up in the bottom quicker and be less efficient. And they're lower-wattage speakers, in general, so their applications

Talking Amps With...

are fairly limited. They're good if you want an old-sounding speaker. Once speakers get to a certain age, they start to get tonally compromised. The neo is very efficient because it gives lots of volume per watt. So, in a Deluxe, it'll maximize in-room volume, but it's smooth-sounding and not as aggressive as a new alnico, which may take time to break in. Old alnico speakers sound as sweet as they do because of age.

And a smooth-sounding speaker in a new amp is definitely not a bad thing, as most new amps can be a bit on the aggressive side.

Exactly. Sometimes, rather than doing a ton of component replacement, I'll replace a few key worn components with new stuff of the same type and quality. And old amps can have broad tolerances. In the upper corner of every one of Leo Fender's schematics it says "All voltages plus or minus 20 percent." That's the spec! The range of sound that can happen

within that 40 percent potential difference is huge. That's why each vintage amp has its own deal.

Can any amp sound great?

Yes, depending on what you're looking for. I've had broken amps that sound great, and I've had guys bring in amps they *want* to sound broken, because that's what they like. There really are no rules. Electronics is physics, and physics is about natural law, so you do have to pay attention. But at the same time, if you know the rules, you know how you can effectively break them. And as we know, there's nothing more fun than breaking the rules!

For more on Blackie, visit tubesville.com.

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