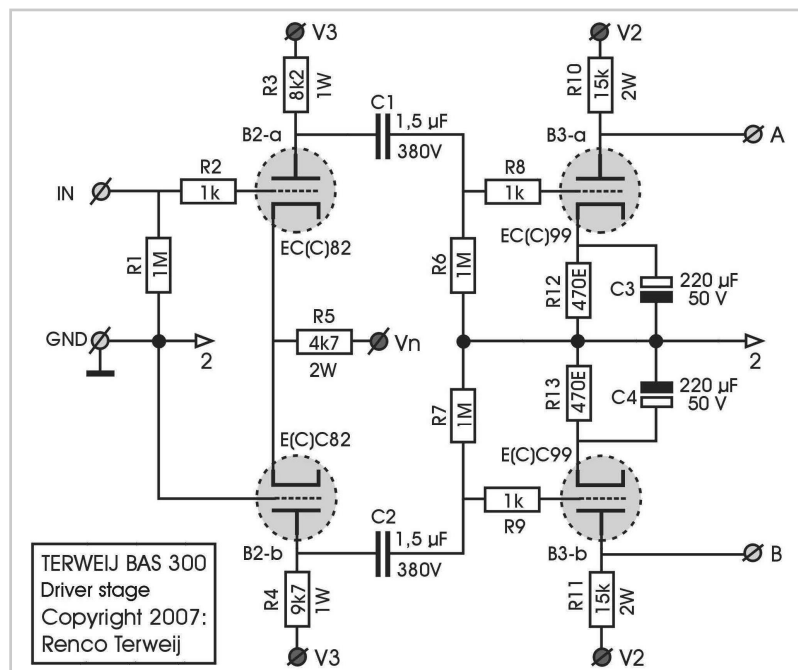


The tube circuit is reasonably conventional. The interesting part is on the secondary side of the output transformer, where there are two power resistors (R23 and R26) in the loudspeaker circuit. The voltages across R23 and R26 are opposite in phase. A trimpot (P4) connected between these two resistors determines which of the two has more influence. The potentiometer can be adjusted from negative current feedback to positive current feedback. In the first case the damping factor increases, while in the second case it decreases, with the result that the output impedance can be varied from 0 to 3 ohms. The nice thing about this design is that it exactly matches the theory described in my second book – the calculations and the actual behavior are identical. That's really nice to see once in a while.

5.1.6 High power amplifier for bass guitar

A third TubeSociety student in 2007 was a bass guitarist who wanted to have at least 200 watts. He certainly knew how to go about it. The schematic diagrams are shown in figures 5.10...5.12.

Figure 5.10:
Driver stage
circuit for 200 W
bass amplifier.



The key to this circuit is the driver stage with an ECC99 in the output. This tube is biased to operate with a high current, so its impedance is well below the level necessary to drive the six tubes in the output stage linearly without any problems and with sufficient headroom (6 dB).

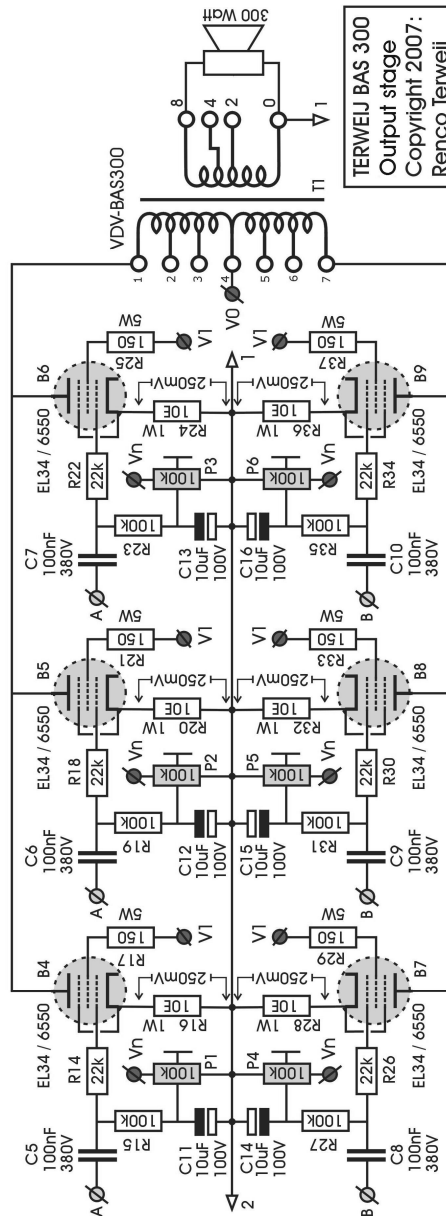


Figure 5.11: Output stage circuit for 200 W bass amplifier.

However, Renco did have a lot of trouble keeping this amplifier stable in use. High-voltage breakdown was just one of the problems he encountered. This can easily happen if you start playing the bass without having the loudspeaker properly connected. The voltage on the output transformer starts swinging wildly, and that

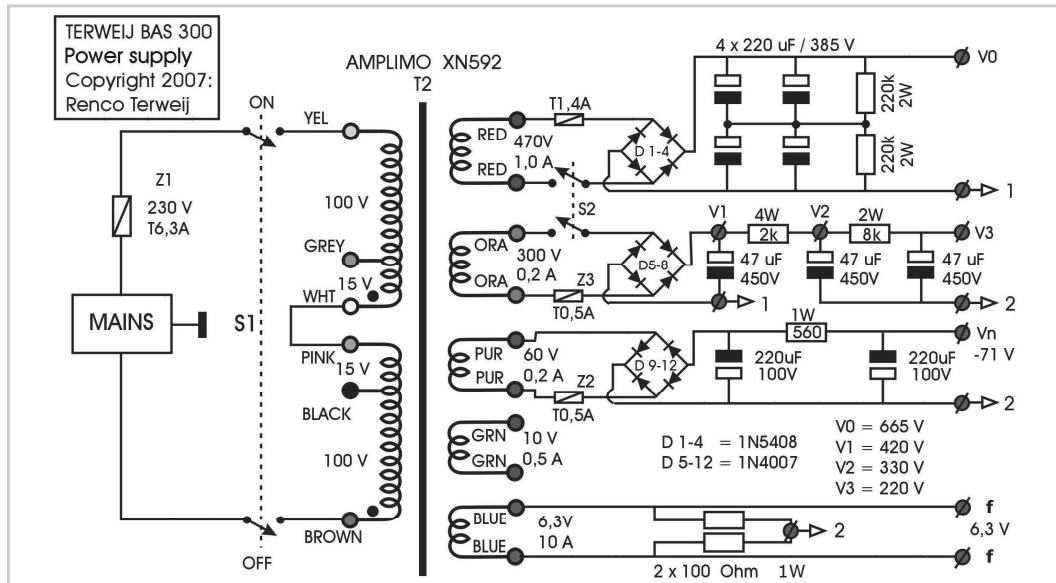


Figure 5.12: Power supply circuit for 200 W bass amplifier.

causes arcing in the tube sockets. When this arcing reaches the filaments, it's game over. The solution that was ultimately found for this problem was to automatically short the secondary in the loudspeaker portion of the chassis when the speaker was not connected.

In addition, three diodes in series, bridged by 220-k Ω resistors to keep the voltage distribution uniform, were connected to each of the anode leads of the output transformer. Under normal conditions these diodes do not conduct, but if the signal amplitude on the primary rises to the point that the voltage goes negative, the diodes start conducting and prevent wildly excessive voltage swings and breakdown.

5.2 SE amplifiers

I want to discuss two amplifiers in this section: an SE design from Bert Fruitema and an SE design from Ari Polisois.

5.2.1 SE design by Bert Fruitema

In our collaboration with Amplimo, Bert and I have divided up the immense task of designing good, reproducible amplifiers using my toroidal transformers. Bert looks after single-ended, and I look after push-pull.