10.2.1 Intermediate amplifier in common cathode-circuit

The standard version of the intermediate amplifier contains *one* tube (almost always a triode) in common-cathode configuration. The circuit is similar or even identical to the first preamp-stage. And why not – the signal has been attenuated by tone-filter and/or volume control and needs to be re-amplified, with the common-cathode configuration being highly suitable. Sometimes, the developers see a need for an impedance conversion in the second amplifier stage – this aspect we will cover in the next section (10.2.2).

In the **common-cathode circuit**, the cathode is connected to "common" i.e. to ground. The required grid-offset is usually generated "automatically" by a cathode-resistor (Chapter 10.1). A capacitor is connected across this resistor in order for the latter to be active only for DC, and to avoid any AC-voltage across it (which would introduce negative feedback). As long as there is not grid-current, this circuit features very high input impedance – although a non-negligible input capacitance (100 pF minimum) does require consideration. The output impedance (internal impedance) results from the parallel connection of the internal impedance of the tube (about 60 kΩ) and the plate-resistor (100 kΩ); the gain factor is about 35 dB (or a bit less if there is significant loading).

Fig. 10.2.2 shows two famous amplifier concepts in comparison: in the Fender circuit, the volume potentiometer directly follows the tone-filter and feeds the intermediate stage, while in the VOX, the intermediate stage is placed between volume pot and tone-filter. **Fender** follows the simple line of thinking: take care of all control efforts at one and the same location. The interaction between the directly connected volume control and tone-filter remains within reasonable limits because the pot is of relatively high impedance (1 MΩ). With the **VOX**, we find an entirely different approach: a special intermediate amplifier with high-impedance input (common cathode configuration) and low-impedance output (common-plate configuration, see 10.2.2) follows the volume pot.

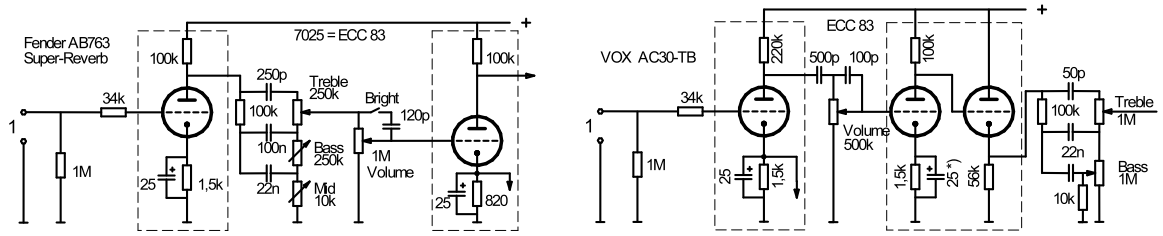

Fig. 10.2.2: Comparison between a typical Fender-circuits (left) and a VOX-circuit (right).
***)** There are VOX amps that do not include the cathode-capacitor for the 2nd tube.

Pushing the discussion of the tone-filter into Chapter 10.3, we will first analyze the 2nd tube-stage of the **Fender circuit**. Both 1st and 2nd tube-stages are fundamentally similar but there are differences regarding the cathode circuit: in the Super Reverb (under scrutiny here), the cathode-RC-circuit also feeds the corresponding cathode of a tube in the other input-channel. Other Fender amplifiers include the same component-saving detail. In the figure, the second tube is not included but an arrow indicates the connection to it. For the grid-offset of the tube(s) to remain at the desired value, the value of the cathode-resistor common to both tubes is approximately halved at 820 Ω (instead of 1,5 kΩ). Since both triodes are feeding relatively high impedance circuits, they have similar voltage gains. Given a regular ECC83, each triode will yield about 32 – 34 dB. The harmonic distortion, however, will be different because the source impedances (ahead of the grid) differ.

