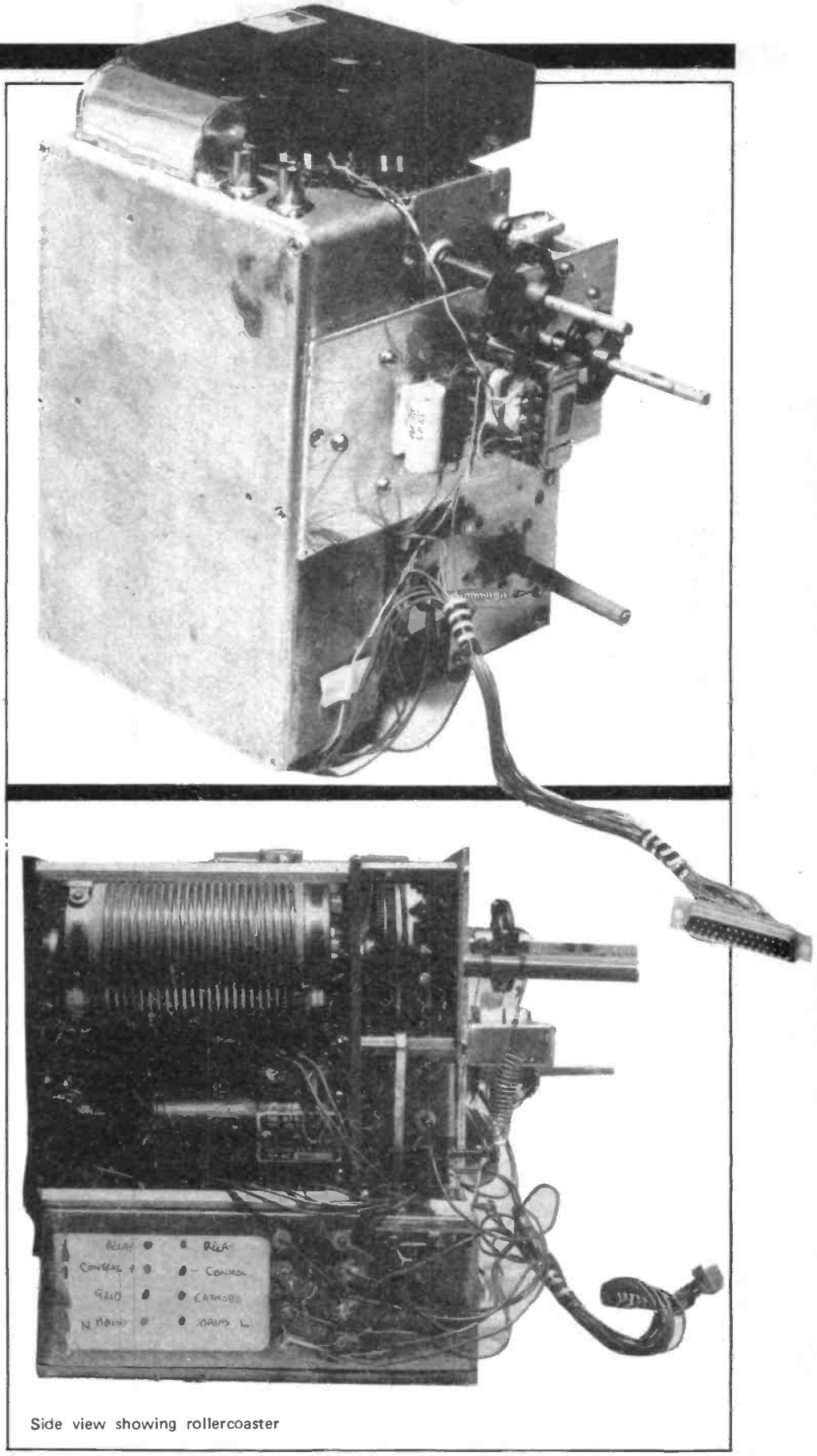
Power supply

The original power supply is more or less as per **Fig. 2** but without the 1:1 transformer in the HT circuitry. Frankly, the transformer is included for those people who are a bit squeamish about playing around with mains level voltages. However, any kind of power supply running at the kV + level should be treated with the greatest respect regardless of how the voltage is generated.

The quadrupler circuit produces a bipolar supply of +660 volts for the anodes and −660 volts for the cathodes. The screen supply is drawn from the OV rail (which is effectively 660V above the cathodes.) My thoughts on safety are these. 660V DC is not nearly as dangerous as 1.3kV DC which is itself less dangerous than 1kV AC, regardless of the original voltage source. If you can guarantee that the external instrument case will not become live regardless of the polarisation of the mains plug, then the equipment can be called safe. In the original design, there are no direct connections made to the chassis although the chassis itself is used as an RF ground. This achieved by making all connections between the circuitry and chasses via high voltage, high reliability capacitors. Note that in both **Fig. 1** and **Fig. 2** the only direct connection of circuitry to chassis is in **Fig. 2** at the secondary of the HT transformer. In the direct rectification scheme, the strap is replaced by a high value fixed resistor. In either case, the chassis is securely earthed to the earth terminal of the incoming mains supply.

NOTE: When rectifying the mains directly, it is necessary to include a 2.5 ohm current limiting resistor in series with the connection to the capacitor/diode bridge. Furthermore, a 'soft start' type of circuit is recommended.

The grid bias supply is derived from the heater transformer. The valve heaters were wired in series because transformers delivering 18V at 2.5A are a lot more easy to come by than those delivering 6V and 7.5A. The quadrupler provides nearly 100V of bias. The supply provides a standing voltage to set the quiescent current on the PA valves (150mA). The impedance of the supply is reduced by using an enhancement MOSFET as a voltage follower. This device transforms the high impedance of the bias supply to a low impedance required by the PA valves. If the valves start to draw grid current because of excessive drive, the extra current is 'reflected back' through the MOSFET to be displayed on the grid current meter.



Side view showing rollercoaster

The screen supply

A lot of care has been put into this part of the circuit. The 4CX250, in common with many other high performance tetrode valves, has strange screen current characteristics. Under