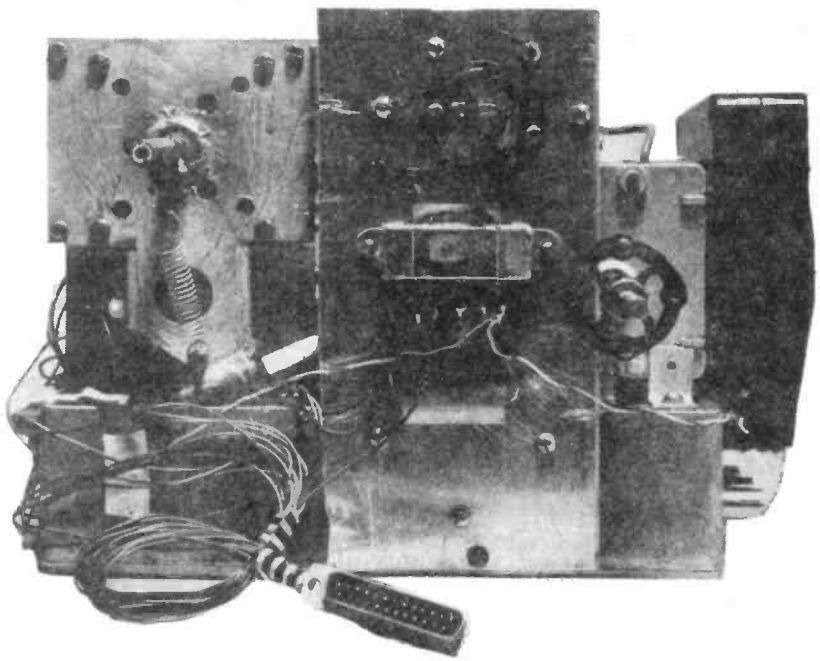
linear amplifier off the shelf as new. The valves themselves would cost £37 each or more while the roller-coaster tuning components and high voltage capacitors would total several hundred pounds. For this reason, I have not given a parts list; the only reasonable way to build QRO designs from new components is to use modern ones: transistors. Even so, the bill would probably come to around £500 and there would be no guarantee that the finished design would work ...

In the event the complete project, a 400W + HF amplifier cost me around £20 plus a ZX81 exchanged for the rollercoaster. The end product has been closely tailored to my requirements: that it should be compact, quiet, reliable, safe and should produce the full output with the 10W of RF available from my homebrew transceiver.

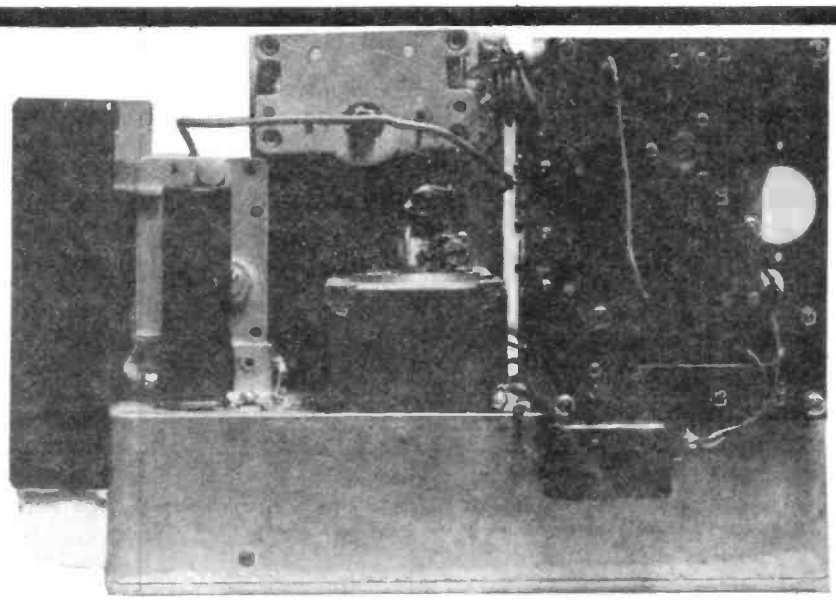
Three 4CX250Bs?

People are often surprised when I tell them what the design requires three of these valves to produce the full legal output; they point out that a single bottle on its own is quite capable of breaking the licence conditions. They are quite right of course. A single valve will produce nearly 500W providing the power supply can deliver some 2.5kV. Going to such a high anode voltage produces all sorts of circuit complications. While it is possible to buy 1kV capacitors off the shelf the same is not true of 2kV+ parts. Similarly, the strings of electrolytics in the power supply are very unreliable. Furthermore, 2.5kV is bad for the health in much the same way as exploding capacitors are bad for the nerves.

Three valves, producing 400W with a supply rail of just 1300V lope along with consummate ease. Their operation is demonstrably linear as received reports indicate. Wishing to ditch the massive HT transformer from the design, I settled upon quadrupling the mains supply to provide the DC HT rail. Thus, the decision to use 1300V came before the decision to use three 4CX250's. It follows that three bottles are necessary to produce a linear 400W of RF at this supply voltage and everything followed from there. My direct rectification system has been entirely satisfactory in use although, on public safety grounds, I have indicated the use of an isolating transformer for the HT supply.



Front view of amplifier proper. The unit connects with the power supply through an umbilical cord. This allows easy removal of the amplifier from the cabinet for servicing, etc.



Rear view. Note the cowling connecting the end mounted cooling fan with the airtight die-cast box. The three valve chimney was made from etched PCB material

Grounded cathodes

There is a lot to be said for grounded grid power amplifiers. They provide a stable easily matched load to the exciter (transceiver) but the drive power requirements are high and the relative gain low, particularly at low HT voltages. The only way to obtain the required gain, some 16dB, is to drive the three paralleled 4CX250 valves in the grounded cathode configuration with the RF drive applied to the grids. At 1300V HT, 300V on the screen and the quiescent anode current set at 150mA (three valves) the control grids require an RF drive voltage of around 90V peak-to-peak. This corresponds to about 20W of RF dissipated across a 50 ohm non-inductive load. **Fig. 1** shows the amplifier schematic. The RF input is stepped up by a ferrite autotransformer in the ratio of two to three. Thus if 20V of drive is applied to the input, then 30V is delivered to the control grids. The impedance is also raised from 50 to 100 ohms. The three valves present a capacitive load of