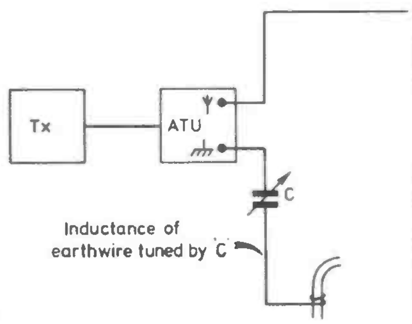

FIG. 2. Inductance of earth return tuned out with series capacitance.

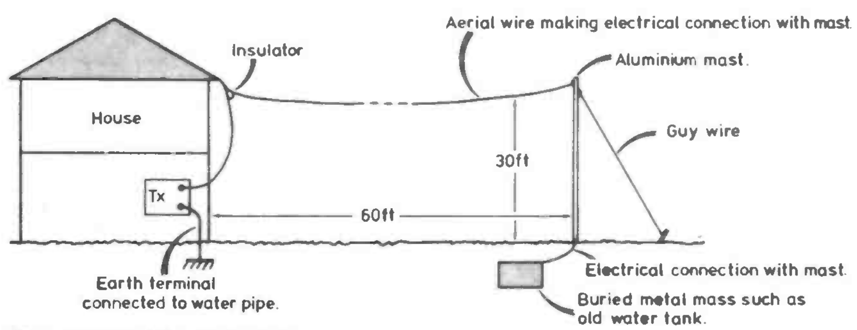

FIG. 3. Compact 160m aerial system.

most of the equivalent devices in the bipolar camp.

The low feedback capacity results astonishingly simple circuitry. The technology reduces this design consideration from dominance to that of negligible proportions. The most dominant feature is the common source lead inductance, even more important becuase of the high gain present in the devices. In conventional terms the 2SK317 exhibits 16dB of gain at 144MHz.

Electrically, the device looks just like a very low impedance tetrode; it is even possible to resonate gate and drain circuitry 'cold' just as you would with a valve amp. However the transconductance measures in the region of 1A/V (one Siemens) while the input capacity weighs in at around 600pF. Output capacity is 90pF.

Although the gate insulation has a value of 100's of Mohms, the VHF input resistance is low. The input signal has to charge and discharge the 600pF input capacity through a real resistance of about one ohm — the gate metalisation resistance, substrate resistance, etc. In fact the MOSFET input approximates fairly well to a big bipolar device at (we estimate) 1R-2j. The ouput looks like a smaller bipolar collector circuit.

Fig. 4 shows Hitachi's own test circuit. The simplicity and similarity to a bipolar circuit cannot be denied. However, all you need to bias the device into linear operation is a small positive voltage applied to the gate through an ordinary resistor. There is no DC bias current with a MOSFET.

Furthermore, (according to the literature) the new technology has all the virtues associated with power MOSFETS: no thermal runaway, no second breakdown and all the rest.

As a promotional exercise for our magazine I persuaded my management to buy a couple of devices — and at £100 a time it took a bit of persuading. We have built a linear with what we believe will become the dominant RF power technology of the next decade. Having virtually no information to draw from, I went right back to first principles.

The design had to be push-pull to increase the impedance presented by a pair of devices rather than halving it which would have been the case with two transistors paralleled up. Why two devices? Because 250W is considerably more spectacular than 125W.

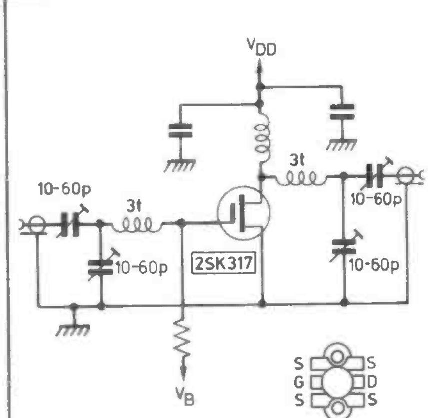

FIG. 4. Hitachi's own test circuit.

The circuit given here is preliminary only and it may be modified as development proceeds. To date I have run the circuit up to the 80W level, 80V supply with just 2W presented at the input. When I have tested the design up to full power level (something undertaken very carefully in small steps; at £100 a time, I can't afford to bust anything) I will present it as a full project in HRT.

Circuit description

The development circuit schematic is shown in **Fig. 5. TL1** is the input balun with its far end connected to the inners of the 2:1 input transformer, TL2, TL3. The characteristic impedance of TL1 should be 50 ohms while TL2, TL3 combination should have a characteristic impedance of 25 ohms each. I didn't have any 25 ohm Teflon cable so I used 50 ohm cable for all three transmission lines. It seems to work OK . . .

The 2:1 transformer places an impedance of 12 ohms across the far ends of L2, L3 providing antiphase driving signals for Q1, Q2. VC1, L2, L3 together with the gate lead inductances of Q1 and Q2 match the 12 ohms of the 2:1 transformer to the 2 ohms series resistance presented by both transistors. L1, a variable light guage hairpin wire loop, provides fine adjustment of input VSWR after VC1 has been resonated for maximum power transfer. In theory L1 should not be needed.

Gate bias is provided via R1 and R2. Idling current should be adjusted for 200mA. Eventually, this will rise to around 6A on speech peaks when using an 80V rail.

L4 tunes out the drain-source capacitance of the devices while L5 slugs common mode parasitics. TL4, TL5 is a symmetrical output balun driving into the single ended Pi coupler, VC2, VC3 and L6. Not only does the coupler provide attenuation of any harmonic products (and there aren't many) but it also allows fine adjustment of the working impedance presented to Q1 and Q2. In theory, the circuit should operate satisfactorily without the coupler in circuit. Anyway, it makes valve people feel at home!