concept. It shows a single conversion superhet running with an IF of 10.7MHz (because components for that frequency are cheap) and the synthesised VFO local oscillator running at 10.7MHz above signal frequency.

The whole design has been oriented towards maximising the strong signal performance in the receive mode. There are relatively few design considerations or constraints about the TX part . . . you either transmit a nice pure carrier wave or you don't.

The part of the system which we will use for this discussion is the IF board; the full circuit diagram for this is shown in **Fig. 3.** Ignoring the role of the double balanced mixer DBM1, the entire strip from IFT1 onwards processes 10.7MHz signals, 10.7MHz being the IF frequency (yes, I know that I have just written **I**ntermediate **F**requency frequency but it seems appropriate somehow) of this single superhet transreceiver.

Wideband signals

The first thing to note is the role of IFT1 and IFT2. Signals coming in from DBM1 will cover a spectrum of perhaps a MHz or so either side of the wanted signal now centred on 10.7MHz and the same amount of signal again at 2f + 10.7MHz. A case in point. You are trying to listen to a weak signal on 7MHz after dark; it may have a peak strength of a few microvolts. The preselector will also allow through the 41m broadcast band where I have measured signal strengths of nearly 100 millivolts. Exactly the same signals will also appear in a band centred on about 25MHz, the inverse image signal produced by the DBM. With two high level spectra present simultaneously, the potential for intermodulation products is endless. Intermodulation products, it should be remembered, are signals which are not harmonically related to anything in particular, and the receiver can 'hear' this mush in an otherwise quiet part of the band masking the real low level signals which are there. IFT1 and IFT2 cut the potential problem in half by rejecting the inverse image signal.

Ideally, an attenuator pad should have been included between the double balanced mixer and IFT1. See **Fig. 4.** Although IFT1 and IFT2 will accept the wanted signal and its spectrum, the inverse image spectrum, much higher in frequency, will bounce off the filter combination and head back towards the DBM causing intermodulation problems inside the mixer itself. Unfortunately an attenuator, while it would have cured the reflection problem, would have cut the wanted signal level. This could have been made up with an RF amplifier stage but then that would have introduced a fresh set of problems. This impasse has been tackled in a different way. Instead of making the IF port of the mixer resistive — the ideal solution as in Fig. 4 — the LO buffer amplifier, not shown on the schematic, will have a resistive output. A DBM is a bit like a pressure vessel with three holes in it. If you stop two up, then you must leave the third open or it will explode. Since it is possible to generate any amount of LO power, we can afford to lose some through a resistive attenuator as in **Fig. 5.**

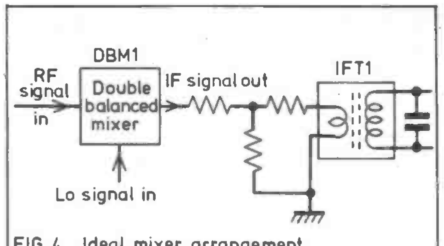

FIG. 4. Ideal mixer arrangement.

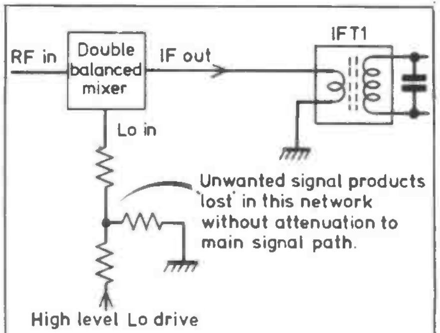

FIG. 5. The practical solution.

IF pre-amp

IFT1 and IFT2 have cut down high level interference to within about 200kHz of the wanted signal. However their main job was to deal with the inverse image spectrum. Q1, the IF pre-amplifier, could still be faced with high level interference and therefore must be very linear in design. The purpose of Q1 is to maintain a reasonably low signal to noise performance: it boosts the signal to a high enough

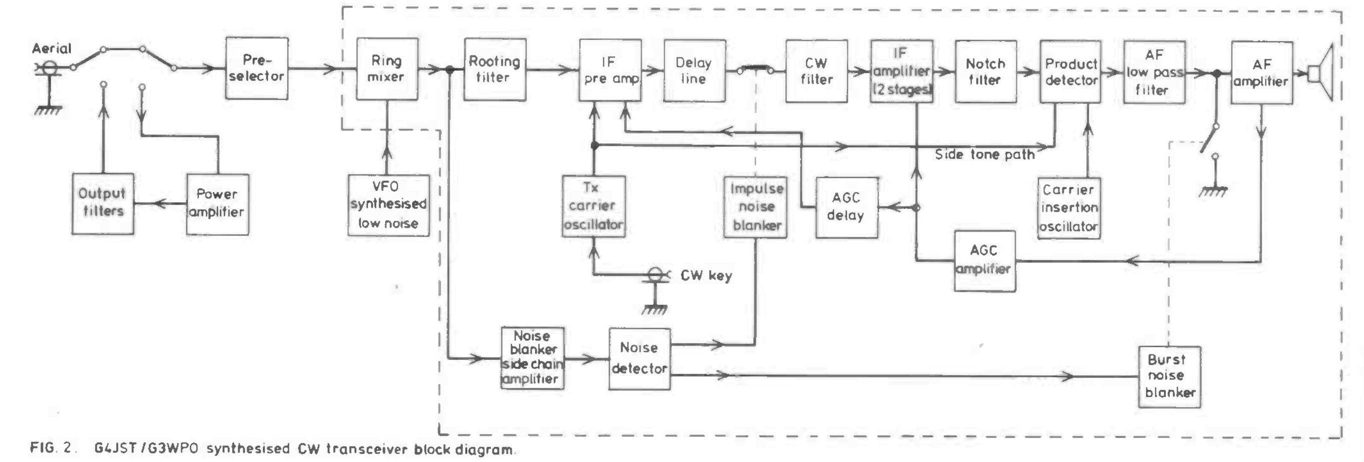

FIG. 2. G4JST/G3WPO synthesised CW transceiver block diagram.