Technicalities

Electronic countermeasures against Russian over-the-horizon radar — Successful RF design: a better CW IF strip. By Frank Ogden *G4JST*

Shooting a woodspecker

The theme for this month's column is 'successful RF design' but first, let's look at a most ingenious little box to come onto the market. No apologies for changing the subject just as soon as it is started but this new HF receiver add-on is very much a case of successful design.

Anyone who has ever listened to the upper reaches of the HF bands will have heard the 'woodpecker', a megawatt pulse over the horizon radar which the Russians use to detect incoming American (one supposes... With Pres. Reagan at the helm, anything goes) missiles. Unfortunately for Europe, placed as it is halfway between Russia and the USA, these massive pulses of frequency agile RF come to earth on the short skip obliterating everything during their short duration. With regular repetition rates of 10's per second they probably do more damage to receiver front ends than the EMP event which they were designed to fore-stall!

As every amateur knows, this wretched menace comes up when the bands are at their most interesting and always when you are about to answer a CQ put out by a ZL3. Some modern HF transreceivers have incorporated special types of noise blankers which reduce the anti-social woodpecker to manageable proportions. People with older sets will not be so lucky. The American company AEA has come up with an add-on box connecting between the aerial and receiver which should shoot the woodpecker. Just how well it works we shall tell you later. We have a unit on loan from the UK importers ICS Electronics and we shall publish the review just as soon as we have completed it.

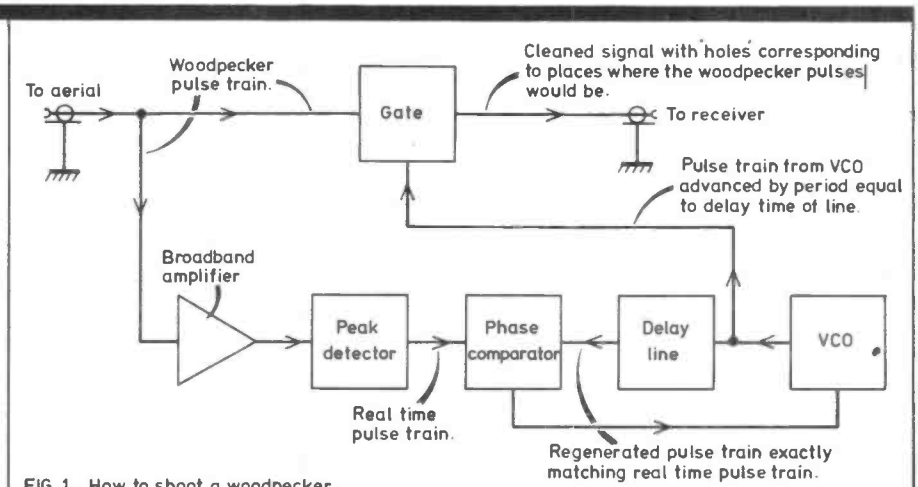

FIG. 1. How to shoot a woodpecker.

It is the way that we think the AEA box works which intrigued us. The *Moscow Muffler* (which is what the company calls it) makes use of the fact that the radar transmissions comprises a very accurately spaced pulse train. The box listens for the woodpecker by amplifying the aerial signal, broadband and then detecting it like a wideband TRF set. An internal oscillator is then phase locked to the incoming pulse train. This accurately re-timed signal — which maintains accuracy even in the presence of lots of other signals — triggers a gating pulse to turn off the signal path to the receiver for the time that the *Moscow Mufler* expects a woodpecker pulse to be present.

The clever thing is that the gating pulse is arranged to blank off the receiver path just a little in advance of the arrival time of the woodpecker. This would be done by delaying the VCO signal to the phase comparator so that the VCO is forced to run just a little bit ahead of time if it is to keep up with the woodpecker pulse train. **Fig. 1** illustrates this.

Successful RF design

This is a fairly wide topic to discuss in the two or three thousand odd words allocated to this monthly column. RF design takes in so much that, to tackle the topic at all, you must discuss it in terms of a specific system to reduce it to dimensions which can be (only just) handled.

Unfortunately my time is too limited to produce design examples purely to illustrate this article and others in the same series. I therefore propose that I shall kill two birds with one stone by designing a piece of gear which shall then be offered as a constructional project in this magazine.

We have received correspondence to this mag and seen lots of it in others asking — even begging — for a low cost, high performance HF transreceiver for CW only. Now I don't particularly like CW as an operating mode simply because I'm not very good at it. On the other hand purpose built CW gear is very straightforward, there is a demand for it, and it offers the most easily understood vehicle for demonstration purposes. The finished transceiver will cover all bands, CW only, produce about 50W of RF, and cost in the region of £100 to build. I shall do the basic design and my mate Tony G3WPO will put the project onto boards.

A CW transreceiver

Fig. 2 comprises the block diagram of the complete transreceiver. There is nothing unusual about the overall