AN AFFORDABLE HELICAL ANTENNA FOR 'TOP BAND'

Flushed with the success of creating coil-loaded antennas for the 7 and 14MHz bands, Phil Selwood G0RKF set about winding one for the 1.8MHz band.

A seemingly impossible r.f. problem at my home location, and working nights prompted me to consider h.f. mobile operating. I had considered v.h.f. mobile, but had found few people 'on air' at the time I leave for work, or to return the following day.

A 45 minute journey, each way to work, convinced me to try h.f. operation. But what sort of antenna should I use? After reading an article by the late **Doug DeMaw W1FB**, in the August 1992§ issue of *PW,* I felt that it obviously had to be a helically wound type for each band of interest.

As I didn't want to be fiddling with controls, especially when driving, each antenna had to be resonated and matched for simplicity. I came to the conclusion that a wound antenna with a shunt capacitor for matching was the best option. I found the formula for working out the total length of wire to use for the coil $\{L = 157/f(\text{MHz})\}$ works quite well.

Plastic Coated

My first antenna was one for the 14MHz band, and was built by winding plastic coated wire around a 2.5m long 10mm diameter 'kite-spar'. This was a length of glass fibre reinforced (g.r.p.) tube usually sold for the purpose of making kites. It's strong, easily available and is not too expensive.

The first antenna was fairly straight forward and needed just 11.5m of wire wound around the spar. I attached one end to the garden fence and wound on the turns keeping the wire fairly tight. Although this method was easy, you need forearms like 'Popeye' to finish the job quickly.

For my second antenna, I moved on to the 7MHz band and again wound the antenna manually. By the time I'd finished I felt as if I'd run Arnold Schwarzeneger's shoulders in for him!

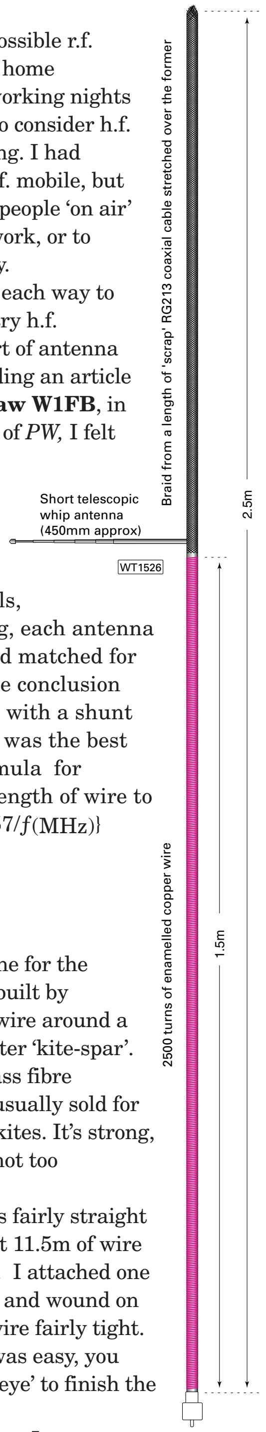

Fig. 1: The layout of the easily-made helically wound 1.8MHz antenna from Phil G0RKF. See Fig. 2 for more detail.

§ **'A Portable Vertical Antenna For HF Operation' by Doug DeMaw W1FB, p34 *PW,* August 1992.**

Aching Muscles

With aching muscles and a desire to make a 'Top Band' antenna, I decided there had to be a better way. This was to be an ambitious design, calling for 2500 turns of 0.56mm (24s.w.g.) to be wound onto a similar 10mm diameter former. A new 'power-assisted' method had to be found, as I didn't want to find myself totally 'muscle-bound' by the experience.

The answer was a 'coil-winder' using my electric drill held in a small vice and controlled in speed by an electronic speed controller built as a college project many years ago. This combination was fed from a supply controlled by a heavy duty 'press-on/press-off' switch that I could press with a foot. Things were almost ready!

Rather than count the turns as they were wound on, I worked out that the 2500 turns would cover 1.5m (allowing for them not to be exactly 0.56mm between centres).

So, the only problem left to solve was how to keep 'whipping' of the former to a minimum. That was answered with several large staples and a length of scrap wood to act as the 'lathe-bed'.

A small hole was drilled in the former about 30mm from one end and the enamelled wire was put in to clamp it in place. I marked the 1.5m point on the former with a pencil mark and placed the g.r.p. tube in the jaws of the drill and lightly knocked several large staples into the lathe-bed to hold the tube in place.

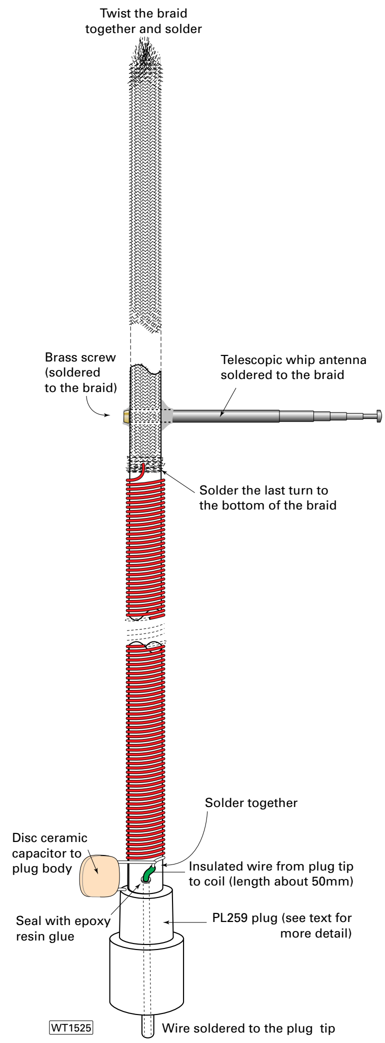

Fig. 2: More details of Phil's antenna. After completion, but before final tuning, the joints and parts of the antenna should be weatherproofed (see text).

Heavy Leather

For safety I had bought myself a pair of very heavy leather gardening gloves so that the moving wire would not cut into my hands. Fully 'gloved-up', I

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gingerly started the drill. and as the the g.r.p. tube turned the wire was fed into the spiral nicely and evenly. The idea was working.

As I reached each large staple, I stopped the drill and keeping turns in place with a few turns of tape, I removed the staple and refitted it over the wound section. On reaching the marked 1.5m point I left a longer 'tail of wire and taped the turns securely in place. (It's important to get the winding uniform and this method works very well).

The upper part of the antenna is made from a length of braiding removed from a piece of 'scrap' RG213 coaxial cable. At the top of the top of the coil, carefully scrape the enamel covering off the wire and solder it firmly in place to the braid. Secure this point with more tape and wearing the gloves carefully pull the braid back up towards the top of the former, where it's twisted together and soldered.

Mounting Method

Now I had to make my choice of mounting method. I chose to fit a PL259/SO2239 as I did not have a tow-bar on the car at the time so, the SO239 socket was fitted to the lip of the tailgate*. In retrospect an 'N'-type plug and socket arrangement would have been better as they can (when fitted properly) can be waterproof. But I've managed with mine by periodically applying a petroleum jelly to the threads. (* *hatch-back door*. Ed.).

The tailgate lip bracket is a useful mounting method on many modern hatch-back cars, when any bumper or tow-bar mounted antenna would be fouled every time the hatch-back was raised. Another advantage is that the antenna is lowered for adjustment every time it's opened too!

Tuning Method

In order to tune the antenna, first, I determined the resonance point of the antenna without the telescopic whip fitted by using a gate dip oscillator (g.d.o.) coupled to the antenna with a small two-turn loop. The frequency turned out to be just 2MHz so, my calculations hadn't been too far out after all.

The second stage of the tuning procedure only requires the telescopic whip to be fitted and the 'new' resonance point to be found. Which in my case turned out to be 1.86MHz, which is almost perfect!

Now close the whip to about half-clength and fit the coaxial cable to the socket base. Now comes the rather more tricky part - selecting capacitors at the base of the antenna to give correct matching. The type of capacitors used must be high voltage (disc ceramic) types. I've found that capacitors in the range of 300-500pF work well.

The antenna has yielded many contacts to GM, GW, GD, EI, F5, ON and EA areas, as well as local nets. So, there you have it! A cheap antenna that gives good service - and it's cheap to make. The 14MHz version cost me about £4.50, the 'Top-Band' antenna cost the princely sum of around £12. *PW*

Errors & Updates

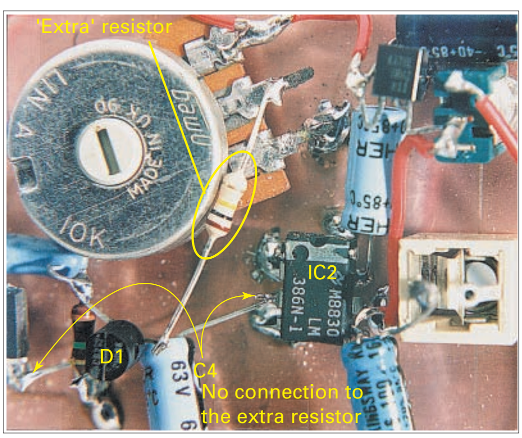
'Carrying On The Practical Way', by George Dobbs G3RJV pages 38/39 *PW* November 2000

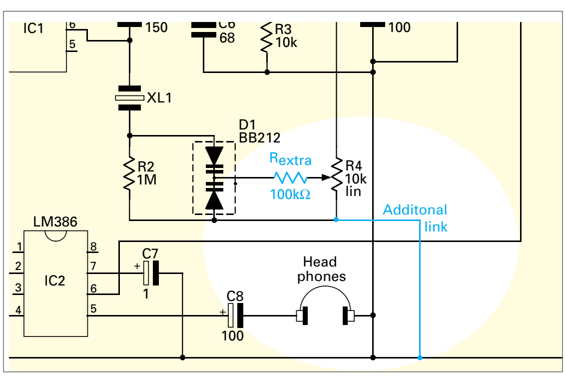
The component shown in the circuit diagram of Fig. 1 as XL1, as a 'Piezo Electric Crystal' is also the item designated as 'Y1' a 3.585MHz 'Ceramic Resonator'. The circuit symbol used is the correct one, as both are piezo electric devices.

Still on the circuit diagram, one component, a 100kΩ resistor was missed off, due to an oversight. The resistor helps to isolate the dual varicap diode (D1) controlling the frequency of the resonator from possible damping by R4 at the lower end of its travel.

Turn now to the photograph of George's prototype below. Although, in the photograph, it may look as if the extra 100kΩ resistor couples to the blue electrolytic capacitor (C4), it bypasses it. Also in this new photograph, you should be able to see that one 'leg' of the electrolytic capacitor couples to pin 3 of IC2, the other leg of the capacitor passes, under R2 (1MΩ) and the legs of the varicap, to connect to the output pin (pin 4) of IC1.

Also on the original circuit diagram of Fig. 1 (p38), there is a missing connection from the connection line, between the 'bottom end' of R4 and the lower anode of the varicap. This circuit connection should have been shown with a further connection to the 0V line (via the copper 'skin' of the p.c.b. material).





'The Simple Capacitance Meter' by James Brett G0TFP pages 16-18 *PW* November 2000.

The photographs of James Brett's prototype Capacitance Meter show that is it was built in a white plastic box as many of you may noticed. And although we did not point this fact out, it was suggested that "In keeping with current EMC practice, a metal box is recommended to prevent any possible radiation of interference".

The photographs were of James' prototype, and no doubt there will be a small amount of spurious radiation within a very short range of the project when it is in operation. We cannot say how much interference would be produced by any particular reader's version of the project, but it pays to be cautious!

We apologise to readers and authors for these errors.

Rob Mannion G3XFD.