The *PW* Midge Catcher

David Banks M0EJB describes the *PW* Midge Catcher…an inexpensive multi-band mobile antenna. If you're keen on working h.f. mobile...it may be just the project for you!

I live on the western edge of the Lake District in North West England. My home is almost surrounded by hills, but with many high roads leading to sites with good horizons, mobile operation in the high h.f. bands is an attractive idea.

However, few multi-band mobile antennas are available, none, apparently, made in Europe. The American-made centre loaded 'Bugcatcher' is very highly regarded but expensive. Fortunately, this type of antenna was very popular for many years in the United Kingdom and information is available which will help the home constructor to build a similar type.

So, determined to have a go myself…I've built one using simple methods, materials from my local builders merchant and the scrap box. My costs were under £20, which compares favourably with the £125 - £300 for commercial versions. This article describes the production of my Mark One Midge Catcher***** its set-up and use.

Note: The author decided on this name because of those rather prevalent nuisance (the polite term!) insects which are found both beside English Lakes and Scottish Lochs!). **Editor.*

Principal Dimensions

The principal dimensions and electrical layout of the prototype are shown in **Fig. 1**. The arrangement shows a continuous lower section, although the original was made demountable.

The coil, wound on a plastic water pipe former has a calculated inductance of 118µH. The upper section, shown in two pieces was so made, such that the retracted whip need not be lowered into the bottom metal section for tuning.

A telescopic upper section would also avoid this. Because the antenna is so freely adjustable for centre-inductance and length, none of the dimensions appear critical and it's inexpensive to try your own variations.

Much Heavier

The total length of the antenna, fully extended, is 2.8m, similar to many monoband whips, but much heavier! The lower stub can be of aluminium or copper and about 18mm diameter, the coil former and joint plugs are of white plastic water pipe, **Fig. 2**, whilst the upper stub is again of aluminium or copper, 9-12mm diameter.

The whip, from another discarded antenna, is 1.2m long and 2.5 mm in diameter. **Warning:** The water pipe **must be suitable** for use at the intended frequencies. A small piece may be tested in a microwave oven, where it should be heated dry in the presence of a cup of water, which should be boiled for two to three minutes. The chosen pipe should remain cool; if it isn't…try another type or make.

The coil is made from single strand copper wire of 1.7mm diameter stripped from three core high current mains lead – 13A is suitable. If the full length coil is made, about 7.2m of wire is required, taken from 2.5m of three core cable. **Be generous**…as you'll need an extra length to grip during winding.

Joints may be soldered. If purchased retail (as mine was), this is the only significant expense in building the antenna! The final material requirement is for the spacer plugs.

On the prototype the spacer plugs were made from various diameters of white pipe. They were then filled with polyester resin and filler as used in boat building in glass reinforced plastic (g.r.p.). This material appears to be widely used in commercial antennas.

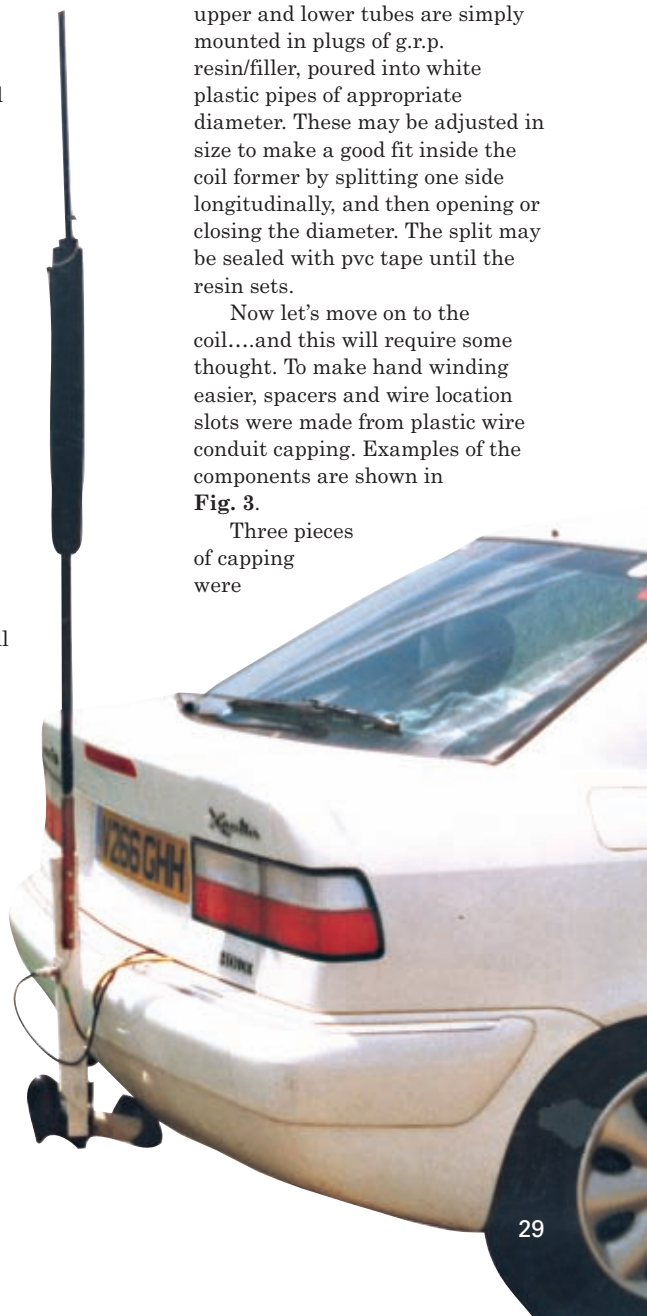
As an alternative, Tufnol (a phenolic resin & fibre material) or even wood may be used. But the ability to pour a liquid resin into a cylinder makes the plug making the easy.

Construction & Assembly

Let's now look at the construction and assembly stages. Firstly, The upper and lower tubes are simply mounted in plugs of g.r.p. resin/filler, poured into white plastic pipes of appropriate diameter. These may be adjusted in size to make a good fit inside the coil former by splitting one side longitudinally, and then opening or closing the diameter. The split may be sealed with pvc tape until the resin sets.

Now let's move on to the coil….and this will require some thought. To make hand winding easier, spacers and wire location slots were made from plastic wire conduit capping. Examples of the components are shown in **Fig. 3**.

Three pieces of capping were



● The completed *PW* Midge Catcher h.f. mobile antenna, posed on M0EJB's car.

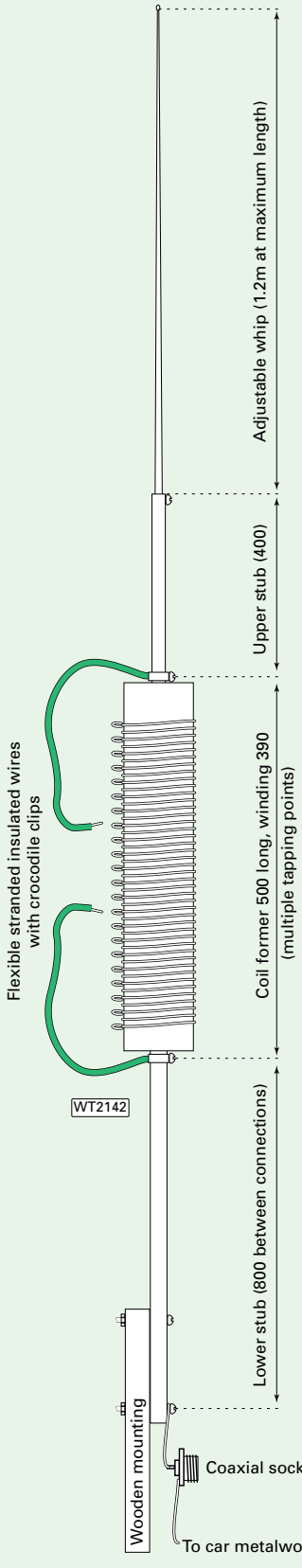


Fig. 1: Details on physical lengths, dimensions and lay-out of the mobile antenna. (See text).

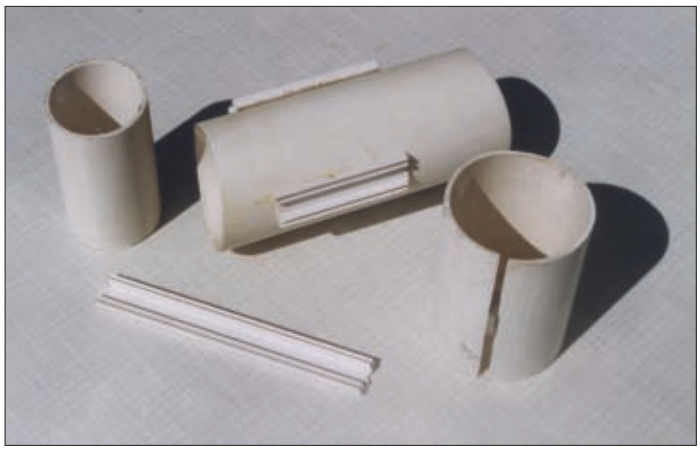


Fig. 2: The starting point - pvc tubing for the loading coil body. The author explains a simple, but essential, test to check that the piping chosen is suitable for radio frequency work (see text).

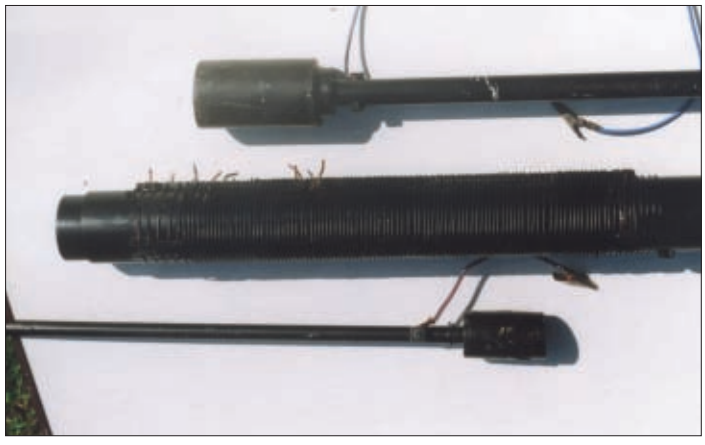


Fig. 3: The principle components of the antenna, the lower section (top), loading coil (with multiple tapping points) and part of the whip section (below).

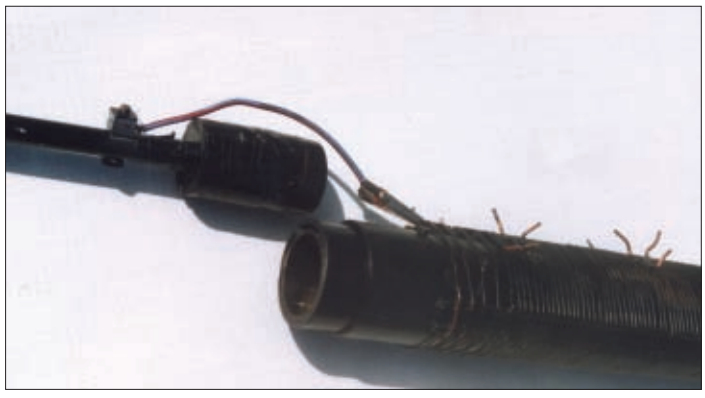


Fig. 4: Author's photograph of the top section whip with its associated plug connection. Note that epoxy resin adhesive must not be used to fix the plug into place and that the last four turns of the loading coil are wide-spaced (see text).

taped, side-by-side, to a piece of wood and slotted, ensuring that wire spacing was maintained close to 3.2 turns/cm or 8 turns/inch. The strips were glued to the former longitudinally at 120° intervals with Evo-Stik floor tile adhesive.

Winding The Coil

Winding the coil was accomplished by stretching one length of stripped wire, holding one end very firmly in a vice. I then walked the former towards the vice whilst rotating, slotting the wire into the slots, taping at intervals to retain position. (The helix was wound anti-clockwise).

As one length of stripped wire is too short for the full coil, where required I soldered the necessary lengths into place. **Note that whilst the wire pitch is nominally as noted above**...the last four turns at the top are 6-8mm spaced to assist fine tuning.

On my prototype a total of 112 turns were wound to cover 3.5 to 28MHz. (Tapping positions will be described later).

The coil ends are then secured by self-tapping screws, see **Fig. 4**. **Note: no epoxy resin adhesive, e.g. Araldite should be used**. Incidentally, Self-tapping screws can also be used to stop the plugs sliding too far into the coil former.

Finally, the upper end of the upper rigid tube must be adapted to clamp the whip. The simplest way is to split the pipe and use a small clamp, e.g. a hose clip.

Alternatively, the pipe wall **may accept** a self-tapping screw with the end filed flat. I used a small, thicker walled brass pipe fitting tapped M4, and this provided an

Fig. 5: Full end-on view of M0EJB's car with the Midge Catcher in place and operational. Note the flying leads for selecting tapping points. See text for mounting and attachment suggestions.

effective clamp with a good electrical contact.

Mounting The Antenna

The lower end of the antenna may be mounted in a variety of ways. I fitted mine to an accessory plate on my car's caravan towing bracket (Heading photograph and **Fig. 5**).

I simply bolted the lower stub to a piece of plastic covered wood and connected the bottom fixing bolt to the centre feed from the coaxial cable to the transmitter. The earth is taken to the car body by 6mm diameter flexible wire.

Braid from discarded large diameter coaxial cable is often used for this job and can be very successful. The quality of the earth connections is important. **Make sure they're clean and paint free!**

Setting Up

It's now time to start the setting up the antenna ready for use on the air. And here…as many readers will remember…the tapping of a close wound centre loading coil is a well known problem…to such an extent that special clips are sold to assist in the use of small crocodile clips without fouling adjacent turns.

I initially tested my completed antenna for feed point impedance and s.w.r. using an Autek RF1 analyser to measure these values at each frequency. (This is not easy, as at this stage, the user will not know where to fix taps, and clips must be used).

However, when the first approximations are made, small **L** shaped stand-off taps may be soldered to the coil for clip connections. The top four or five wide spaced coils require one or more L clips each.

Next, using an analyser or your s.w.r. meter, find the approximate setting on the coil body and finely adjust at the top take-off point. On first tests I found, as expected, impedance of the order of 18-25Ω on 3.5 and 7MHz, but even so, at all frequencies from 3.5 to 28MHz, the s.w.r. was less than 2:1.

As I have a mobile antenna matching unit (An MFJ 845, as often illustrated by the Editor as he uses one for mobile/portable work), I use this for final adjustment for transmission. This has allowed me to record s.w.r.s below 1.3:1 on all bands.

As a guide, **Table 1** shows some of my final tap positions. However, you'll be very fortunate to duplicate these with a home built system!

Band (MHz)	Top lead (Tapped)	Bottom lead turns:- (Tapped)	Whip (extension)
3.5	2 turns down	9 turns from the base	Full
7	2 turns down	34 turns from the top	Full
14	1 turn down	10 turns from the top	Full
18.068	Top turn	5 turns from the top	Full
21	-	*Direct to top (coil by-passed)	Full
24.89	-	*Direct to top (coil by-passed)	70%
28	-	*Direct to top (coil by-passed)	50%

Table 1: Tap and whip positions for matching on seven h.f. bands. Note: In the direct mode, the two crocodile clips are connected together, eliminating the coil.

Ready To Go!

So, you're now ready to go. It's not necessary to set all frequencies before using the antenna, as this can be done in stages. In use, I carry mine dismantled and use it only when stationary.With suitable bracing the antenna could be carried erect. But at full length the whip moves some distance…so please bear this in mind!

As with many home projects, this antenna evolved during construction and several possibilities for improvement exist. When, as is likely, a MkII is built, the modifications shown below will probably be adopted:- (i). The lowest frequency covered will be 40m, making a shorter, wider spaced coil for easier adjustment. (ii). The mounting plugs will be made integral with the coil former, to tidy these areas, and simplify the joints. (iii).

Either a telescopic whip, or two fixed length sections for low and high frequencies will be used to avoid any possibility of a lowered whip sliding into the lower stub. So, there it is…the *PW* Midge Catcher! I hope that your project gives you as much pleasure and interest as mine has - I've certainly learned a great deal. *PW*

Further Reading

1) **Waters P. G3OJV** *Waters & Stanton Catalogue 2001* pp 126-7
2) **Irwin, W.K. W*1*KI** The High Sierra HS 1500 Mobile Antenna. ARRL, *QST* Nov.1999 pp 72-73
3) **King, F.W. KM4IE** A $20 mobile antenna. ARRL, *QST* April 2000 pp *33-35.*
4) *Moxon L. HF antennas for all locations* RSGB 2nd Ed. 1993 Chapter 16.
5) *Dodd, P. Backyard Antennas RSGB 2000 pp 35-38.*
6) High Sierra Antennas http://www.hsantennas.com/info
7) http://www.texasbugcatcher.com/
8) http://www.visradio.com
9) http://www.eham.net/reviews/detail/412